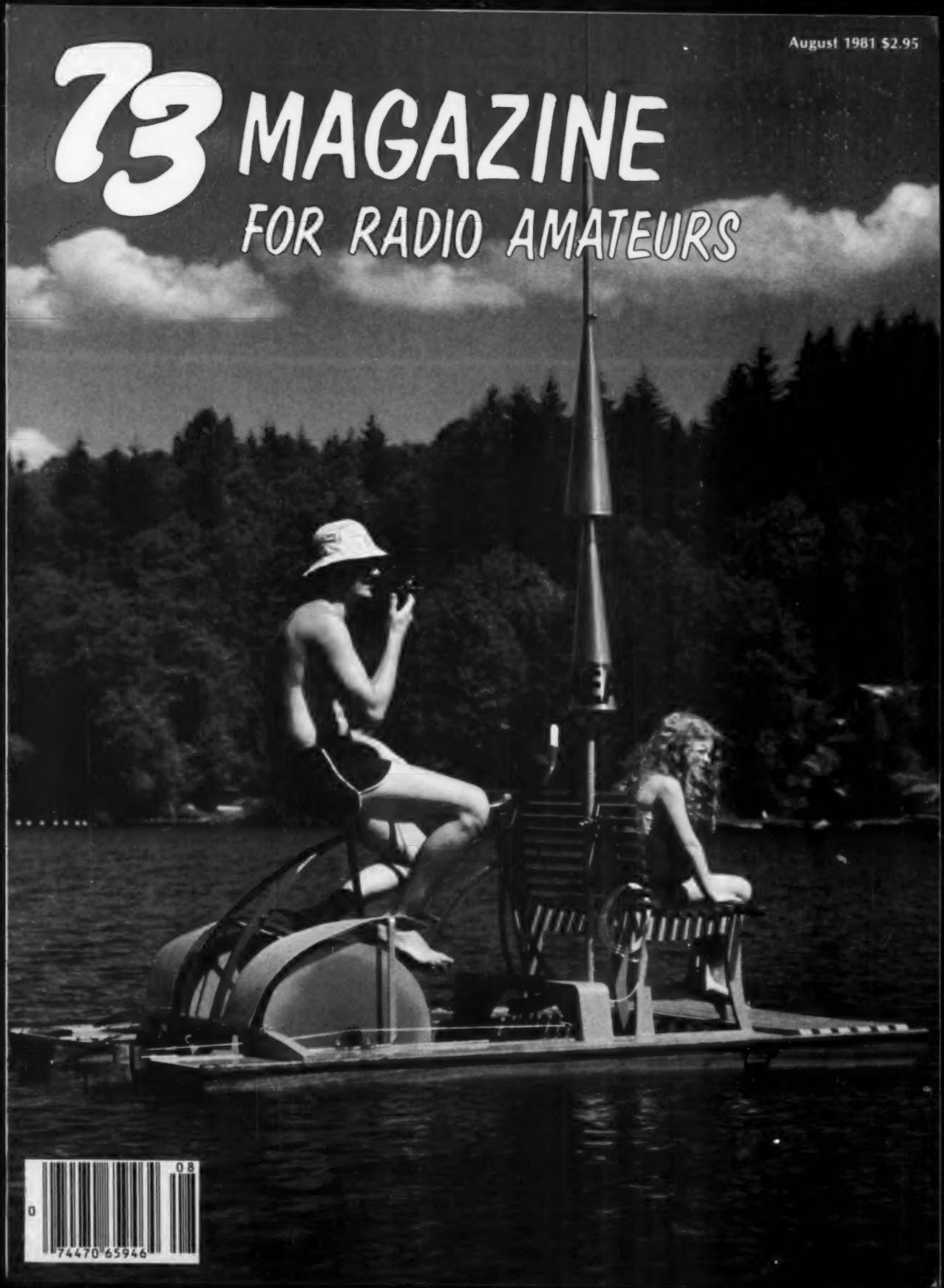
August 1981 $2.95
73 MAGAZINE
FOR RADIO AMATEURS
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# tempo does it again

# THE WORLD'S FIRST 440 MHz SYNTHESIZED HAND HELD RADIO

Tempo was the first with a synthesized hand held for amateur use, first with a 220 MHz synthesized hand held, first with a 5 watt output synthesized hand held...and once again first in the 440 MHz range with the S-4, a fully synthesized hand held radio. Not only does Tempo offer the broadest line of synthesized hand helds, but its standards of reliability are unsurpassed...reliability proven through millions of hours of operation. No other hand held has been so thoroughly field tested, is so simple to operate or offers so much value. The Tempo S-4 offers the opportunity to get on 440 MHz from where ever you may be. With the addition of a touch tone pad and matching power amplifier its versatility is also unsurpassed.

The S-4...$349.00
With 12 button touch tone pad...$399.00
With 16 button touch tone pad...$419.00
S-40 matching 40 watt output
13.8 VDC power amplifier...$149.00

## Tempo S-I

The first and most thoroughly field tested hand held synthesized radio available today. Many thousands are now in use and the letters of praise still pour in. The S-1 is the most simple radio to operate and is built to provide years of dependable service. Despite its light weight and small size it is built to withstand rough handling and hard use. Its heavy duty battery pack allows more operating time between charges and its new lower price makes it even more affordable.

## Tempo S-5

Offers the same field proven reliability, features and specifications as the S-1 except that the S-5 provides a big 5 watt output (or 1 watt low power operation). They both have external microphone capability and can be operated with matching solid state power amplifiers (30 watt or 80 watt output). Allows your hand held to double as a powerful mobile or base radio.

S-30...$89.00* S-80...$149.00*

*For use with S-1 and S-5

## Tempo S-2

With an S-2 in your car or pocket you can use 220 MHz repeaters throughout the U.S. It offers all the advanced engineering, premium quality components and features of the S-1 and S-5. The S-2 offers 1000 channels in an extremely lightweight but rugged case.

If you're not on 220 this is the perfect way to get started. With the addition of the S-20 Tempo solid state amplifier it becomes a powerful mobile or base station. If you have a 220 MHz station, the S-2 will add tremendous versatility.

Price...$349.00 (With touch tone pad installed...$399.00)
S-20...$89.00

**Specifications:**
Frequency Coverage: 440 to 449.995 MHz
Channel Spacing: 25 KHz minimum
Power Requirements: 9.8 VDC
Current Drain: 17 ma-standby 400 ma-transmit (1 amp high power)
Antenna Impedance: 50 ohms
Sensitivity: Better than .5 microvolts nominal for 20 db
Supplied Accessories: Rubber flex antenna 450 ma ni-cad battery pack, charger and earphone
RF output Power: Nominal 3 watts high or 1 watt low power
Repeater Offset: ±5 MHz

### Optional Accessories for all models

12 button touch tone pad (not installed): $39 • 16 button touch tone pad (not installed): $48 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Leather holster: $20 • Cigarette lighter plug mobile charging unit: $6

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| 10W | 130W | 130A10 | $189 |
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| 2W | 80W | 80A02 | $169 |
| 10W | 80W | 80A10 | $149 |
| 30W | 80W | 80A30 | $159 |
| 2W | 50W | 50A02 | $129 |
| 2W | 30W | 30A02 | $ 89 |

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FEP-1 earphone, rubber flex. ant.

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Elm Street
Peterborough NH 03458
Phone: 603-924-7138

### Circulation Offices:

Elm Street
Peterborough NH 03458
Phone: 603-924-7296

### Subscription Rates

In the United States and Possessions:
One Year (12 issues) $25.00
Two Years (24 issues) $38.00
Three Years (36 issues) $53.00

### Elsewhere:

Canada—$27.00/1 year only, U.S. funds. Foreign surface mail—$35.00/1 year only, U.S. funds. Foreign air mail—$62.00/1 year only, U.S. funds.

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*All controls on front panel
*Freq control variable 300 Hz to 2500 Hz will match any rig.
*LED flashes during decoder operation
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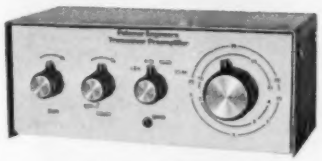
Preamplifiers

The famous Palomar Engineers preamplifier has been updated and packaged in an attractive new cabinet.

For the SWL there is the P-305 (9-v DC powered) and the P-308 (115-v AC powered) featuring full shortwave coverage, selection of two antennas, 20 db attenuator, 15 db gain control and on-off-bypass switch.



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**All models have these features:**

- **Up to 20 db gain.**
- **Covers 1.8 to 54 MHz in four bands.**
- **Low noise figure.**
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- **8" x 5" x 3". Brushed aluminum control panel. Black vinyl cover.**
- **SO-239 connectors.**
- **LED pilot.**

Order direct or from your favorite dealer. Model P-305 Receiver Preamplifier for 9-v DC $99.95. Model P-308 for 115-v AC $109.95. Transceiver Preamplifier Model P-310X $129.95. Model P-312X $129.95. Add $3 shipping/handling. Calif. residents add sales tax.

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**Wild Turkeys 1, FBI 0**
—another foul-up from the feds.....WA7UDO 12

**Sailplanes on Six**
—these thermal-hunting hams have an edge on the competition.....WB3BQO 20

**The Supernova Station Organizer**
—in this project, four into one will go!.....W3BYM 26

**Review:**
**Kenwood's TR-9000**
—the multi-mode 2-meter rig that's making SSBers out of VHFers.....WB8BTH, N8RK 30

aug. 81
73 MAGAZINE

**A Flier's Guide to the Airwaves**
—off we go into the wild blue yonder.....WB6BHI 58

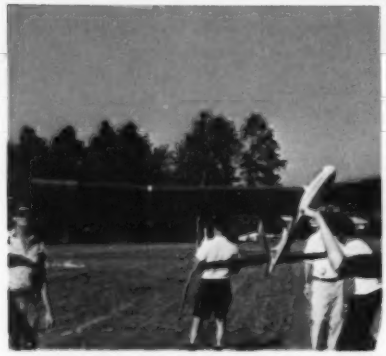
**Cybernet Ten-Meter Offset**
—If you've gone CB to 10, why not go all the way? Add the repeater offset, too!.....K3NXU 66

**A Stout Heart for a Simplex Autopatch**
—put your KIM-1 to work.....WD8CHH 70

**Review:**
**The Bearcat 350 Programmable Scanner**
—a first-class act from Electra.....WA4PYQ 78

**Review:**
**The Calectro Multi-Tester**
—a full-size, lab-type multimeter for fans of analog operation.....W8FX 80

**Review:**
**How To Defend Yourself Against Radar**
.....N8RK 85



**Review:**
**Butternut's HF5V-III Vertical**
—this one really does work equally well in all directions.....KA1LR 34

**The Meterless Ohmmeter**
—an audible continuity tester.....WB7NEZ 36

**QRM-Free Antenna Tuning**
—with this inexpensive noise bridge.....Staff 40

**IC-2A Accessories the Cheap Way**
—build 'em yourself and save.....AD5X 44

**Solar-Powered Alignment Tool**
—using Old Sol to find true North.....K6BW 48

**The DX Primer**
—low power plus low antennas plus good technique equals 300 countries.....W8YA 50

**Review:**
**Guide to RTTY Frequencies**
.....K8DIU/4 87

**The History of Ham Radio**
—part XVII.....W9CI 88

**Review:**
**The Robot 800H**
—a specialty terminal for RTTY/Morse/SSTV and you.....WB9PKD 92

**The Better Vertical**
—elevated feed means low angle of radiation.....WD9AHH 94

**Review:**
**The TET SQ-22 Antenna**
—walking the dog with a two-meter quad....KA1LR 99

**Newcomer to Nicads?**
—you'll get a charge out of this informative overview.....W6OJF 100

**Never Say Die—6, Fun!—102, Leaky Lines—104, Ham Help—105, 143, Contests—106, DX—120, Awards—122, Social Events—123, New Products—128, RTTY Loop—132, Letters—133, Looking West—134, Kahaner Report—136, Corrections—137, OSCAR Orbits—142, Dealer Directory—162, Propagation—162**

**Cover: AEA's Mike Lamb and daughter Julie go bicycle marine mobile with the Isopole™ 144. Photo by Audris Skuja.**

# W2NSD/1
# NEVER SAY DIE
*editorial by Wayne Green*

### ROCHESTER HAMFEST CLOSED DOWN BY TAX OFFICIALS

New York tax officials descended on the Rochester Hamfest and closed down the ARRL booth, threatening president Harry Dannals with an arrest warrant if he continued to hawk his books and magazines. It was at the height of the hamfest just before noon on Saturday, with an estimated 3,000 people milling around the flea market and the handful of exhibitor booths, when the tax officials and police arrived.

The police cars drove up and down the aisles of the flea market, demanding that everyone pack up and leave immediately. Inside the exhibits building, the tax officials demanded proof of a tax certificate, which few exhibitors could produce. The exhibits were then forced to close down. The *73* booth was permitted to continue without interruption, though the *QST* booth was closed.

This all got started about two years ago when several ham dealers collected the New York state taxes on sales, but then did not turn them into the tax department. Out-of-state ham dealers who just ignored the tax did not cause problems, but the collecting of the tax without the payment of it was too much. A New York ham dealer complained through his state congressman and the heat was on.

Last year, a tax official turned up to investigate and made it clear that this sort of thing would have to stop. He told all exhibitors to be sure to get state tax certificates, collect the tax, and pay it. Again, some of the dealers collected the tax... and didn't pay it. The New York ham dealer, feeling that this gave his competitors an undue advantage... the tax collections being pure profit... complained again through his congressman.

When the tax people and the police showed up at the peak of the hamfest, the committee went into hiding and offered no help or advice. The only statement, issued hours later, was to the effect that the committee had no position on the tax one way or the other. The situation was one of total confusion.

The media got the word, and television teams soon arrived, causing a fast exit by the police and tax people. The threats of arrest warrants were apparently just scare tactics... and of questionable legality. Exhibitors would have done best, it turned out, to just keep on selling. Losses in sales have been estimated at about a quarter of a million dollars.

Just to make things even worse, security at Rochester was poor and many exhibitors found themselves made miserable by thieves. Some were working in teams to distract dealers while an accomplice grabbed equipment. One dealer lost three HTs... from the *back* of his exhibit booth!

### PLAIN LANGUAGE DEADLINE EXTENDED

A last-minute effort by *73 Magazine*, the ARRL, and others has resulted in a 60-day extension of the deadline for filing comments on the Plain Language Rules docket. You now have until August 21 to contribute your thoughts about PR 80-729.

We urge every club and repeater association to take a close look at the docket and then submit specific, constructive comments. If you would like to be a formal participant in the comment process, file an original and five copies. If you file an original and 11 copies, every Commissioner will see your remarks. Of course, the FCC will consider all comments, regardless of the number of copies submitted. The important thing is to speak out before the August 21 deadline.

Until October 21, the FCC permits you to file *replies* to comments received by August 21. The difficulty lies in obtaining copies of the many comments the Commission has received. One good way to obtain these comments is to contact the individuals who filed them. For more details about the FCC's activities, call the Office of Consumer Assistance at (202)-632-7000.

### W2NSD ON-THE-AIR SCHEDULE AUGUST, 1981 8:00-11:00 PM EDT

| | |
|---|---|
| 4 | 15m-20m RTTY |
| 11 | 20m-40m Phone |
| 18 | 15m-20m CW |
| 25 | 15m-20m Phone |

Look for us in the first 25 kHz of the General portion of each band. We'll be on the higher frequency band first.

### MILLER HASSLE WON'T QUIT

The dumping of Miller as a director of the ARRL and the naming of his opponent, Metzger, without the benefit of even counting the votes, has upset hams in Indiana considerably. We published some letters on the subject and I'm told by some of the *73* team which was at Dayton (nine of us were there) that a chap claiming to be a lawyer for Metzger came by the booth yelling and threatening to sue us over the letters. He apparently came across loud and obnoxious.

If this chap is representative of Metzger, the division is in for a most interesting time. I don't envy them. More information has been promised on the details, but from everything I've heard it is a clear-cut case of the ARRL wanting to get rid of a director who was asking too many questions. The smear of Miller is continuing. Insignificant things are being blown up out of all proportion to try to justify the character assassination of Miller. Pity.

### DAMNED GOVERNMENT

Many of us expect to see the federal government react about the same as the states to a reduction in funds: Cut the most important and visible services first, protecting the bureaucrats to the last. It is nice that Reagan has put out a call for the public to blow the whistle on government waste, bad management practices, and fraud. If you've run into any such, you might send word to Howard Messner, Office of Management and Budget, Room 10208, New Executive Office Building, Washington DC 20503.

It appears as if there is going to be a try at getting the government out of the large-scale printing business, too. That'll be a relief.

### PETERBOROUGH DAYS

"Our Town," as Peterborough is called as a result of being used as the role model for the play of that name many years ago, is having an all-out bash on August 6-7-8th, and you're invited.

# Dyna-"mite."

## Miniaturized, 5 memories, memory/band scan

# TR-7730

**The TR-7730 is an incredibly compact, reasonably priced, 25-watt, 2-meter FM mobile transceiver with five memories, memory scan, automatic band scan, UP/DOWN manual scan from the microphone, and other convenient operating features.**

TR-7730 FEATURES:

- **Smallest ever Kenwood mobile**
  Measures only 5-3/4 inches wide, 2 inches high, and 7-3/4 inches deep, and weighs only 3.3 pounds. Mounts even in the smallest subcompact car, and is an ideal combination with the equally compact TR-8400 synthesized 70-cm FM mobile transceiver.
- **25 watts RF output power**
  Even though the TR-7730 is so compact, it still produces 25 watts output for reliable mobile communications. HI/LOW power switch selects 25-W or 5-W output.
- **Five memories**
  May be operated in simplex mode or repeater mode with the transmit frequency offset ±600 kHz. The fifth memory stores both receive and transmit frequency independently, to allow operation on repeaters with nonstandard splits. Memory backup terminal on rear panel.
- **Memory scan**
  Automatically locks on busy memory channel and resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **Extended frequency coverage**
  Covers 143.900-148.995 MHz in switchable 5-kHz or 10-kHz steps, allowing simplex and repeater operation on some MARS and CAP frequencies.
- **Automatic band scan**
  Scans entire band in 5-kHz or 10-kHz steps and locks on busy channel. Scan resumes when signal disappears or when SCAN switch is pushed. Scan HOLD or microphone PTT switch cancels scan.
- **UP/DOWN manual scan**
  With UP/DOWN microphone provided, manually scans entire band in 5-kHz or 10-kHz steps.
- **Offset switch**
  Allows VFO and four of five memory frequencies to be offset ±600 kHz for repeater access (or to be operated simplex) during transmit mode.
- **Four-digit LED frequency display**
  Indicates receive and transmit frequency during simplex or repeater-offset operation.
- **S/RF bar meter and LED indicators**
  Bar meter of multicolor LEDs shows relative receive and transmit signal levels. Other LEDs indicate BUSY, ON AIR, and REPEATER offset.
- **Tone switch**
  Activates internal subaudible tone encoder (not Kenwood-supplied).

**Optional accessories:**

- **MC-46** 16-button autopatch (DTMF) UP/DOWN microphone
- **SP-40** compact mobile speaker
- **KPS-7** fixed-station power supply

More information on the TR-7730 and TR-8400 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

KENWOOD
*...pacesetter in amateur radio*

## Synthesized 70-cm FM mobile rig

# TR-8400

- **Synthesized coverage of 440-450 MHz**
  Covers upper 10 MHz of 70-cm band in 25-kHz steps, with two VFOs.
- **Offset switch**
  For ±5 MHz transmit offset on both VFOs and four of five memories, as well as simplex operation. Fifth memory allows any other offset by memorizing receive and transmit frequencies independently.
- **DTMF autopatch terminal**
  On rear panel, for connecting DTMF (dual-tone multifrequency) touch pad (for accessing autopatches) or other tone-signaling device.
- **HI/LOW RF output power switch**
  Selects 10 watts or 1 watt output.
- **Virtually same size as TR-7730**
  Perfect companion for TR-7730 in a compact mobile arrangement.
- **Other features similar to TR-7730**
  Five memories, memory scan, automatic band scan (in 25-kHz steps), UP/DOWN manual scan, four-digit LED receive frequency display (also shows transmit frequency in memory 5), S/RF bar meter and LED indicators, tone switch, and same optional accessories.

*Specifications and prices are subject to change without notice or obligation.*

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Jim Gray W1XU, Mgr.
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To do our part in the celebration, we're going to have a wide selection of back issues of *73* available for the taking... plus ham gear and parts collected by me over the last 40 years. We have to make room for a new magazine and that means I've lost my ham equipment storage rights. Pick 'em over and watch my stifled sobs as you walk off with my treasures.

The town will be having a lot of special events, including a circus on the 6th, a muster on the 8th, a relatively short marathon race, sports tournaments in tennis, swimming, softball, and volleyball, a book sale, square dancing, a bluegrass band, kite flying, an antique show... there's no end to it.

Add to this your chance to visit (and perhaps operate from) the W2NSD ham shack, the growing *73* publishing offices, Instant Software, etc. You may not believe what resources and people it takes to bring you this magazine every month.

Our Town is one of the most beautiful in New England and it is situated in one of the most remarkable little valleys in the country. One visit and you'll see why New Hampshire is one of the fastest growing states in the country. Remember that we have no sales taxes, so when you shop you pay the actual retail price for everything.

If you can arrange for a few days in New Hampshire, you should include a visit to the White Mountains, about 100 miles north of Peterborough. You may want to stop off in Warren and see the Morse Museum. From there you are a short drive to Franconia Notch and the amazing Flume, the Foot Basin, and the first North American tramway on Cannon Mountain.

If you have some time and like to climb around, you might want to visit Lost River, right near Franconia Notch. Or you might want to join the multitudes who have climbed Mt. Washington... or at least take the cog railway to the top. The last time I climbed the mountain I took the train back down.

So, if you and your family are within driving distance of lower New Hampshire, you might plan on getting up here in early August to see us... and to get in on some of the fun of Peterborough Days. We monitor 147.54 when you're in the area.

This is a mecca for famous writers and artists, so you may be bumping elbows with people who stay at our MacDowell colony, such as Leonard Bernstein, or some of the well-known local residents, such as Ed Land. You never know who you are going to see in the A&P.

One of the highest mountains in southern New Hampshire is in Peterborough, complete with a road to the top. Bring a good HT or mobile rig and see how many repeaters you can kerchunk from there. I've often gotten up there in the early mornings and made contacts all the way down to Washington DC. Long Island is a snap. This is where the big-effort VHF contesters gather.

**Well... I Can Dream, Can't I?** **by Bandel Linn K4PP**

**"Honey, I know you're talking to DX... I've put dinner on hold... just tell me when you're ready to eat!"**

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Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is an astonishing ± .1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our SS-32 encode only model is programmed for all 32 CTCSS tones or all test tones, touch-tones and burst-tones. And, of course, there's no need to mention our 1 day delivery and 1 year warranty.

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- Meets all new RS-220-A specifications
- Available in all 32 EIA standard CTCSS tones

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## Frequencies Available:

| Group A | | | |
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| 67.0 XZ | 91.5 ZZ | 118.8 2B | 156.7 5A |
| 71.9 XA | 94.8 ZA | 123.0 3Z | 162.2 5B |
| 74.4 WA | 97.4 ZB | 127.3 3A | 167.9 6Z |
| 77.0 XB | 100.0 1Z | 131.8 3B | 173.8 6A |
| 79.7 SP | 103.5 1A | 136.5 4Z | 179.9 6B |
| 82.5 YZ | 107.2 1B | 141.3 4A | 186.2 7Z |
| 85.4 YA | 110.9 2Z | 146.2 4B | 192.8 7A |
| 88.5 YB | 114.8 2A | 151.4 5Z | 203.5 M1 |

- Frequency accuracy, ± .1 Hz maximum − 40°C to + 85°C
- Frequencies to 250 Hz available on special order
- Continuous tone

| Group B | | |
|---|---|---|
| TEST-TONES: | TOUCH-TONES: | BURST-TONES: |
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| 1000 | 770 1336 | 1650 1900 2200 2450 |
| 1500 | 852 1477 | 1700 1950 2250 2500 |
| 2175 | 941 1633 | 1750 2000 2300 2550 |
| 2805 | | 1800 2100 2350 |

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15

# Wild Turkeys 1, FBI 0

## — another foul-up from the feds

**Editor's Note: Some portions of the FBI reports in this article may appear to our readers to be confusing, incomplete, and/or disjointed. They appear that way to us, too.**

*J. J. Howard WA7UDO*
*3119 Smith*
*Boise ID 83703*

*Photo A. The jamming transmitter in the sagebrush, enclosed in a black-painted first-aid box. Wires lead to the plastic-wrapped, buried batteries.*

What do the FCC, FBI, jamming transmitters, and coyote hunters have to do with each other? Read on and you will soon come to know.

On December 2, 1979, a low-power jamming transmitter (less than 0.1 Watt) was placed in a remote area near Boise, Idaho. The transmitter consisted of a VHF Engineering transmitter strip with a quarter-wave antenna attached to sagebrush. The transmitter was located in such a way that detection in the Boise Valley was made difficult.

The transmitter output was set on the input of our local club repeater (146.22-146.82) located on a high mountain peak just north of Boise. Since the repeater was located around other commercial radio and TV transmitters, I assumed, as others did, that a birdie was locking the repeater up and timing it out, rendering it useless.

Since I am a pilot, I thought one way to locate a signal on the input to the club repeater would be to jump into the airplane and do some looking with han-

# The Rig That Filters The Crowd

# TEN-TEC OMNI-C

**OMNI-C has what it takes to filter the crowds.** To narrow the Amateur Radio world right down to the particular signal you want. The selectivity, sensitivity, dynamic range and operational features you need to cut any crowd down to size.

**Tailored i-f response.** OMNI is equipped with the potential for ***seven*** response curves to handle any listening situation.

Standard filters include an excellent 8-pole 2.4 kHz crystal ladder filter and, in addition, a 150 Hz active audio cw filter with three ranges (450, 300, 150 Hz).

Optional filters include 1.8 kHz 8-pole crystal ladder ssb filter, 500 Hz 8-pole cw filter, and 250 Hz 6-pole cw filter.

Front panel switches put any optional filter in series with the standard filter for up to ***16 poles of filtering*** for near ultimate skirt selectivity.

Four i-f response curves for ssb and three for cw. That's response tailoring, that's crowd control.

**Optimized sensitivity and dynamic range.** The OMNI sensitivity range of 0.3 $\mu$V typical (slightly less on 160 & 80M) combines with a 90 dB dynamic range to provide an ideal balance that will handle any situation from copying a weak signal half way 'round the world to keeping the next-door kilowatt from muscling in. And a PIN diode switched 18 dB attenuator is included for extra insurance against overload.

**More crowd-handling features—and all standard equipment.**

***Built-in notch filter.*** To drop out unwanted signals or carriers. Tunable from 200 Hz to 3.5 kHz, with a 50 dB notch depth.

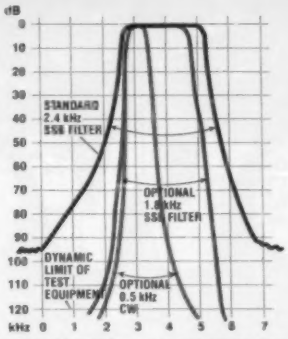
***3-mode, 2-range offset tuning.*** To put you where the others aren't and where the elusive DX is. Move just the OMNI receiver, or just the transmitter section, or the entire transceiver, ±500 Hz or ±4 kHz. For complete freedom of frequency movement to get away from the crowds.

***Built-in noise blanker*** for those times when your noise-generating neighbor is crowding your receiver. Filtered to handle the big signals easily.

***2-speed break-in.*** When QRM or QRN is heavy, switch to "Slow." Use "Fast" for instant, full break-in for enjoyable rag-chews or stalking DX.

**OMNI-C features stand out in any crowd.**

**All solid-state**—from the pioneer, Ten-Tec.

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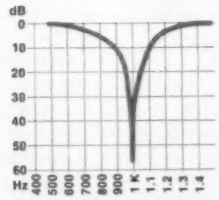


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**Broadband design** for instant band change without tune-up or danger of damage to the final amplifier. Another Ten-Tec *original*.

**"Hang" AGC** for smoother action.

**WWV reception** on the 10 MHz band.

**Digital readout in two colors,** red for the 5 significant places, green for the 6th digit (100 Hz). Instant recognition.

**Separate receiving antenna capability.** Switch receiver to a common antenna for transceive or separate receive-only antenna; the system also acts as receiving antenna by-pass with an instant break-in linear amplifier or transverter.

**"S"/SWR meter,** electronically switched.

**200 watts input, all bands,** with 50-ohm load. 5 year pro-rata warranty.

**100% duty cycle** on all bands up to 20 minutes. Full RTTY and SSTV power.

**Built-in VOX and PTT** with front panel controls.

**Built-in phone patch jacks** for easy interface.

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**Built-in adjustable sidetone** volume and pitch.

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**Front panel control of linear or antenna.** The rear panel bandswitch terminals control relays or circuits in step with front panel bandswitch.

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**Built-in speaker,** compression-loaded; in bottom of cabinet.

**Plug-in circuit boards** for fast easy service.

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During the period from December 6, 1979, through January 11, 1980, a survey was conducted by Special Agents of the Federal Bureau of Investigation at all known outlets in the Boise, Idaho, area, in an effort to determine if any purchase was made of a radio crystal operating on the frequency of 146.82 megacycles with negative results. A similar survey was conducted at all known outlets in the Boise, Idaho, area of Ray-O-Vac multiple ignition batteries to determine if the identities of any persons purchasing such batteries during the pertinent period could be identified. This survey also met with negative results.

The evidence obtained from the Blacks Creek Summit, including the first-aid kit housing the transmitter, along with the batteries, wire, wire antennas and plastic sheet protecting the battery, were submitted to the Federal Bureau of Investigation Laboratory by communication dated January 8, 1980.

By communication dated June 13, 1980, the Latent Fingerprint Section of the Federal Bureau of Investigation, Identification Division, advised that there were no latent prints of value present or developed on any of the specimens submitted. On the same date, the Federal Bureau of Investigation Laboratory report advised that tool mark examinations on the submitted items bore very limited tool marks, which were not sufficiently characteristic to determine the tool type and were of no value for identification purposes.

By Federal Bureau of Investigation Laboratory report dated April 11, 1980, the Federal Bureau of Investigation Laboratory advised that the ends of the white nylon string attached to the transmitter submitted to the Federal Bureau of Investigation Laboratory for examination were not suitable for matching purposes. The report also stated that the black paint utilized to cover the JOHNSON AND JOHNSON first-aid kit housing the transmitter could not be specifically identified with a particular source.

By Federal Bureau of Investigation Laboratory report dated May 21, 1980, the Federal Bureau of Investigation Laboratory advised that the transmitter submitted to the Federal Bureau of Investigation Laboratory for examination was apparently a factory made circuit board and various electronic components, which function as a transmitter. The device appeared to have been modified to some extent before being installed in a JOHNSON AND JOHNSON first-aid kit with a bare wire antenna and COAX wire power cord. When the transmitter was connected to the two Ray-O-Vac multiple ignition batteries in series, the transmitter transmitted a frequency of approximately 146.22 megahertz. The report went on to advise that the crystal in the transmitter was marked in part "146.22" and bore the manufacturer's name, "ICOM." No type or Serial Number were noted on the crystal, circuit board or other components of the device. The Federal Bureau of Investigation Laboratory advised that ICOM was believed to be the name of a Japanese manufacturer, whose parts are carried by many dealers.

The Federal Bureau of Investigation Laboratory report went on to advise that the two six volt multiple ignition batteries were both tested to be functioning and applied adequate voltage to operate the transmitter.

On June 25, 1980, the facts of this case were discussed with Assistant U. S. Attorney [redacted] District of Idaho, Boise, Idaho, and he advised that this matter was not suitable for prosecution in U. S. District Court. He stated that the violation was at best a technical violation, and the statute to be applied to this violation was designed to protect the Civil Defense Communications Network from acts of espionage to subvert their defense capabilities, and since this matter appeared to have involved a dispute between two different amateur radio clubs and particular individuals, he did not feel this matter was suitable for prosecution in U. S. District Court. For this reason, he recommended that this violation be referred to the Federal Communications System for whatever administrative action they would deem appropriate.

*Fig. 1. Summary report of FBI actions.*

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/24/80

SA [redacted] accompanied [redacted] JIM HOWARD, and [redacted] to the vicinity of Blacks Creek Summit in Ada County, Idaho. The purpose of the trip was to attempt to locate the transmitting device jamming the receiver operated by the Boise County Amateur Radio Club, of which [redacted] HOWARD, and [redacted] were members. The trip was made to a parking lot located near the Summit of the Blacks Creek Road in a four-wheel drive vehicle owned [redacted] b7c

From there, utilizing a hand-held direction finder and two snowmobiles, the transmitting signal was traced from the parking lot to an area located near the Arrow Rock Dam Access Road. This access road is located down the hill a short distance from the Summit on the north side of the Summit. The access road to the Arrow Rock Dam leaves the Blacks Creek Road in a westerly direction. From there, it winds around through the sagebrush hills and according to a sign just off the Blacks Creek Road, this access road dead ends at the Arrow Rock Dam.

Utilizing the snowmobiles, the group traveled to a high point on the road where the direction finder pointed to an area on a knoll from which a strong radio signal was originating. Subsequent examination of that area located a transmitter tied to a sagebrush and attached by a wire to two Ray-O-Vac six-volt multiple ignition batteries buried in the ground. The transmitter was housed in a Johnson and Johnson auto travel first aid kit box, which was painted black and sealed from the weather. The Ray-O-Vac six-volt batteries were protected by a piece of plastic and covered with dirt.

At the time this transmitter was located, JIM HOWARD had in his possession a walkie-talkie radio set at the frequency for the jammed transmitter. When the batteries were removed from the transmitter, the receiver immediately came on the air.

The transmitter, the antenna, the string used to hang the transmitter, the wire attached to the batteries, and the batteries, were secured as evidence and removed from the hill.

Investigation on 12/5/79 at Boise, Idaho File # BT #52-5826

by [redacted] b7c Date dictated 12/10/79

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*Fig. 2. Special Agent's investigation report of actions on December 5.*

die-talkies. So, on December 4, another radio amateur and I departed Boise in search of the signal which was locking up our club repeater. I was confident that the signal was emanating from the hill where the repeater was located—probably among those commercial transmitters with thousands of Watts of power.

Wrong. The signal increased as we flew in a southeasterly direction, reaching its full strength about 20 air miles southeast of the repeater site.

That evening, in darkness, I and two other members of the club returned to the site and made a ground search with just a handie-talkie. The lack of passable roads, snow, and darkness made our efforts in locating the transmitter unsuccessful, but the following evening, with the aid of snowmobiles, better DF equipment, and with others, including a local agent of the FBI, we returned to the site. Within about 20 minutes the transmitter was located, and it was taken off the air by the FBI agent. He said the transmitter and batteries would be sent to Washington DC for a thorough evaluation.

Unknown to us, the FBI staked the site out the following day and apprehended two local radio amateurs apparently returning from the site where the transmitter had been hidden. It was reported by the agents that their tracks led directly to the sagebrush in which the transmitter was hung. The two hams denied having any knowledge of the hidden transmitter and said they were only coyote hunting.

The wheels of bureaucracy began to turn. We waited and waited for reports from the FBI on materials sent to the lab. The FBI was unable to link the evidence recovered to those persons apprehended at the site.

On June 25, 1980, the FBI discussed the case with the Assistant US Attorney, District of Idaho. He recommended that this violation be referred to the Federal Communications Commission for whatever administrative action that they deemed appropriate. After we heard this news, I made an attempt to obtain a copy of the FBI report under the Freedom of Information Act. After the exchange of several letters and a long wait, I got copies of FBI reports on September 15, 1980. The entire matter was now in the hands of the real Paper Tiger—the Federal

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*Fig. 3. Special Agents' report of actions on December 6.*

FEDERAL BUREAU OF INVESTIGATION

.- 1 - Date of transcription 1/25/80

SAs [redacted] and [redacted] established an observation point near a knoll a short distance from the Blacks Creek Summit where the radio transmitter had been located on the previous day. The purpose of this observation was to determine if the individuals who were responsible for placing this transmitter device would return to that location when the radio discontinued transmitting on December 5, 1979.

This observation was maintained from 8:00 a.m., until 3:00 p.m., on December 6, 1979. The site of the observation point enabled the Agents to observe the north slope of Blacks Creek Summit and any vehicle traffic passing over that Summit could be readily observed.

At approximately 11:00 a.m., an older model pickup was observed traveling down the icy Summit Road in a northerly direction. The vehicle continued on out of sight and was not again observed until approximately 1:00 p.m. This was the only vehicle observed in the area during the time of the observation and the observation was discontinued at 3:00 p.m., in order for the Agents to return to their vehicle at the Summit of Blacks Creek Road and continue the observation.

Both Agents walked from the observation point down the access road to the Arrow Rock Dam to the Blacks Creek Road. While walking up the north slope of the Blacks Creek Road toward the Summit, a GMC pickup with a camper was observed traveling down the slope toward the Agents. The time of the observation was 3:30 p.m. Observed on the vehicle was Idaho License [redacted] which was designated as an amateur radio license. The vehicle was occupied by two white males.

The driver of the vehicle, who was wearing a beard, stopped the vehicle and asked the interviewing Agents if they needed assistance. They were informed that the Agents' vehicle was at the top of the Summit and no assistance was required.

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Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] Date dictated 12/10/79

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BT #52-5826 - 2 -

The Agents immediately returned to their vehicle and proceeded down the slope to the junction of the Black Creeks Road and the access road to the Arrow Rock Reservoir. Observed parked approximately 140 feet in front of this access road was the vehicle earlier observed. Observation of that area located two sets of footprints in the snow that went directly from the pickup to the gate to the access road to the Arrow Rock Dam.

The Agents followed these tracks up the path on the access road to a point where the tracks were lost. Due to the time involved in realizing that the two individuals had probably already reached the site where the transmitter had been recovered, the Agents returned down the path to where the tracks had earlier been lost and determined that the two individuals had taken a shortcut over the top of a knoll.

The interviewing Agents then continued down the access road and positioned themselves at a point approximately 100 yards from where the access road joined the Blacks Creek Road. While waiting for the two individuals to return, the Agents heard the engine in the pickup truck start and heard the truck drive away. The Agents immediately returned to their vehicle and upon examining the tracks left by the vehicle, it was determined it had proceeded on north down the Blacks Creek Road toward the area of Prairie, Idaho. The Agents followed these tracks and at approximately 4:35 p.m., the pickup truck was observed and stopped by the Agents. At that time, the occupants of the vehicle were identified. The driver of the vehicle presented his Idaho driver's license and identified himself as [redacted], Idaho. The description obtained from his driver's license is as follows:

| | |
|---|---|
| Race | White |
| Sex | Male |
| Date of Birth | [redacted] |
| Height | 5' 11" |
| Weight | 155 pounds |
| Hair | Brown |
| Eyes | Brown |
| Social Security Account | [redacted] |
| Driver's License | [redacted] |

BT #52-5826 - 3 -

The occupant of the vehicle was identified by driver's license and by oral statements as [redacted], Boise, Idaho. His driver's license described him as follows:

| | |
|---|---|
| Race | White |
| Sex | Male |
| Height | 6' |
| Weight | 185 pounds |
| Hair | Brown |
| Eyes | Brown |
| Date of Birth | [redacted] |
| Selective Service Number and Idaho Driver's License Number | [redacted] |

[redacted], acknowledged that the vehicle belonged to him and he gave both Agents permission to look in the cab of the pickup and in the camper area of the pickup. At that time it was determined that MEISSNER had a radio in his pickup which was set at the frequency of 6.820 megacycles.

WAS NOT Committed

Observed in the camper area of the pickup was a Super 48 Preco wet battery, which had been installed on a battery charger and was in the process of being charged.

After the identification was made, the Agents returned to the scene where the pickup had been parked and at that time the footprints were back tracked from the pickup to a point north of where the vehicle had been parked over a large bank and up the hill toward the sight where the transmitter had been located on the previous day. The Agents followed these tracks which were the only tracks observed in the snow in that area. The tracks went together for a short period and separated. One pair of tracks was north of the other and went over several deep slopes and continued on to the exact location where

BT #52-5826 - 4 -

the transmitter had been located on the previous day. The other set of tracks were followed to a point where they joined the access road to the Arrow Rock Dam and continued on where they met the other pair of tracks and continued to the spot where the transmitter had been located.

Both of these pairs of tracks made a distinct pattern in the snow and in the mud, making them easy to follow. A rough sketch was made of the track design, which matched the design on the soles of the boots worn by [redacted] and [redacted] at the time they were identified.

Copies of the sketches of the two footprints are attached.

---

Communications Commission.

I called the Portland Office of the FCC and they said there wasn't much they could do with this case. I was told that if I wasn't satisfied with their actions I should contact my Congressman or the head of the FCC Investigations Division in Washington DC. After many, many calls to the FCC in Washington, they finally informed me that the evidence that was presented to them in FBI reports was extremely weighty but circumstantial. A staff member of the Investigations Division informed me that the FBI probably had apprehended those individuals responsible for the act.

In essence, the FCC suggested that they could not take actions against the individuals since it was not illegal to be apprehended at the site of the jamming transmitter. I asked what circumstances might enable them to prosecute. They informed me that if the individuals had picked up the transmitter, that would have been sufficient evidence. In other words, had the FBI left the transmitter and the individuals had picked it up, then that might have been sufficient evidence.

I wonder.

Had those individuals

BT #52-5826 - 5 -

allegations. It was determined that [redacted] b7c
selling this equipment purchased at surplus properties for a profit. Once the allegations had been confirmed, the organization was completely disbanded by the Governor. [redacted] had no idea the Governor would take such drastic action, but assumed that he would only stop members from that organization from buying this surplus property and selling it at a profit. At the time this club was disbanded by the Governor, he was severely criticized by the membership and did make several enemies at that time.

[redacted] explained the jamming of their repeater b7c
being experienced at this time as follows:

On December 2, 1979, the repeater located on Chaeffer Butte stopped functioning at approximately 11:00 a.m. At that time he was listening to his radio and heard the signal come on and run three minutes. After three minutes, the signal dropped off because that was the time of the setting of the timeout timer. [redacted] that b7
this meant the repeater was either stuck or was being jammed.

On Monday, December 3, 1979, he went up to Deer Point with three other members of his club, [redacted] b7
[redacted] and [redacted]
On arrival at the site, he reset the timer and the signal came back on the repeater. The signal stayed on for three minutes and again timed out. [redacted] that meant there was a signal input into the receiver and lacking a directional finder to locate this signal input, he returned to Boise, Idaho.

The following day, December 4, 1979, at approximately 2:00 p.m., he and JIM HOWARD rented a plane at GEM AIRLINES and flew over the site with a direction finder and found the transmitting signal was coming from Blacks Creek Summit, approximately 17 miles from the transmitter. They over flew the Summit and the meter on the receiver pinned straight down, confirming the general location of the transmitter on the Summit. From the air, he could see snowmobile tracks in the area.

BT #52-5826 - 6 -

Later that night, he returned to the area of the Blacks Creek Summit with [redacted] and JIM HOWARD. b7
They walked to the Summit with a direction finder and again located the general site of the transmitter, which was north by east of the Blacks Creek Summit. They were receiving ten signal strength units on their direction finder, which was the maximum reading indicating a very strong signal. This direction finder and the strength of the signal would place the proximity of the transmitter very close.

[redacted] stated that from the strength of the b7c
signal, it would indicate to him that the transmitter should have a large storage battery. He also believed the transmitter would have an 11-foot beam antenna.

[redacted] said that their radio equipment transmitted b
at 146.82 megacycles and received at 146.82 megacycles.

[redacted] also explained that if he and JIM HOWARD b7
had not rented the aircraft to try to locate the transmitting device, he did not believe the equipment they had available to them would have allowed them to find the location because of the lack of access to any of the land between where the transmitter was located by the aircraft and the location of the repeater. It would have involved an almost impossible task of walking through the area between Blacks Creek Summit and the site of the receiver with a direction finder, a distance of 17 miles. For this reason, he did not believe that the persons who installed the transmitter believed that it could ever be found.

He also said that the transmitter was placed in a location where it could not be detected from the Boise Valley because the signal was originating from an area over a hill, which blocked out the possibility of it being transmitted into the valley. For this reason, the frequency utilized by their club was blocked out without any detectable signal coming in on the radio. It was only after they went up over Blacks Creek Summit that they were able to pick up any signal on that frequency and under normal circumstances, and without the use of the airplane, they would have assumed the transmitting device jamming their receiver would have been located somewhere near Chaeffer Butte.

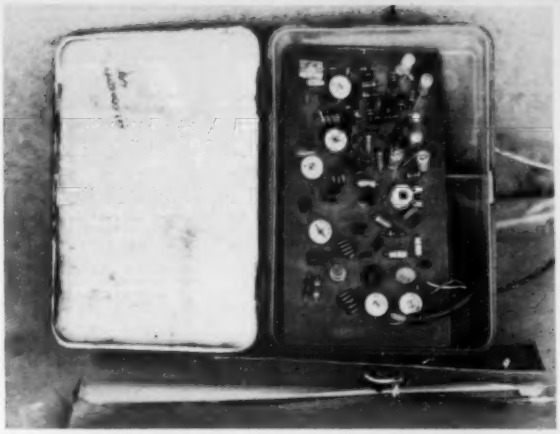

*Photo B. The transmitter in the first-aid box.*

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

[redacted] driver of a GMC b7c
pickup bearing Idaho license [redacted] who was stopped by the interviewing Agents on the Blacks Creek Road, was advised of the identity of the interviewing Agents and the nature of the inquiry.

[redacted] furnished the following information: b7c

He advised that he was in that area with [redacted] b7c
to look for a place to hunt. When asked what sort of game he was interested in, he stated that they were going coyote hunting.

[redacted] denied having any knowledge at all about b7c
an illegal transmitting device that had been placed on a hill near the Blacks Creek Summit and in explanation for the reason why he was observed on a hill at the exact location where this illegal transmitter had been removed on the previous day, he commented that he was just following a lot of tracks, and he wanted to see what had been going on. He continued to say that he knew nothing about the illegal transmitter.

[redacted] stated that the GMC pickup and camper b7c
driven by him was owned by him and the Idaho State motor vehicle license, [redacted] were his call letters since he was a licensed amateur radio operator.

[redacted] gave the interviewing Agents permission b7c
to look into the cab of his truck and into the camper area and when the Agents found a Super 48 Preco battery in the camper area of his truck, he stated that he had always carried the battery in a cabinet area of the camper and it needed charging.

At the conclusion of the interview, [redacted] b7c
was asked his destination, and hesitated that he planned to go on to Prairie, Idaho, area and back through Mountain Home.

12/6/79 Ada County, Idaho BT #52-5826

Investigation on [redacted]

SA
SA [redacted] b7c

by [redacted] Date dictated 12/10/79

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BT #52-5826 - 7 -

[redacted] was also asked to display the soles of b7c
his boots and upon observation of the design on the sole, it appeared to be the same design on the tracks earlier observed by the interviewing Agents, along the access road to the Arrow Rock Dam.

*Fig. 4. Report on FBI interview with first coyote hunter.*

been apprehended with the transmitter in hand at the site, the story could have been very, very similar: "We were only coyote hunting and found this device tied to the sagebrush." And as the scenario unfolded, I could perhaps have expected a similar reply from the Federal Communications Commission: "It is not unlawful to be apprehended at the site of a jamming transmitter while coyote hunting and stumbling across a device of unknown nature."

In conclusion, I believe that the Federal Communications Commission, in another classic case, has shown its unwillingness to do its job. After a year of investigation and several hundred dollars spent by local radio amateurs, and probably thousands of dollars spent by the government (FBI, FCC, etc.), the efforts of many were brought to an end by the FCC and their do-nothing attitude.

All reports and observations should end with a

FEDERAL BUREAU OF INVESTIGATION

- 1 - Date of transcription 1/25/80

[redacted] an occupant of the GMC pickup bearing Idaho license [redacted] which was stopped on the Blacks Creek Road by the interviewing Agents, was advised of the identity of the interviewing Agents and the nature of the inquiry. He, thereafter, furnished the following information: b7c

In response to a question as to why he and [redacted] were in the exact location where a jamming transmitter device had been located on the previous day, he stated he did not know anything at all about this transmitter and explained his reasons for being in that area as looking for a place to hunt. He was asked specifically why he went to the exact location where the transmitter had been located and he responded by saying he went on that hill because he saw all the tracks and commented that it "looked like a war had been going on."

[redacted] continued to deny having any knowledge at all about the transmitter being placed on that hill and when he was interviewed concerning the location of this illegal transmitting device, he stated that he believed [redacted] was trying to get him in trouble. When asked who [redacted], he responded by saying, "He's an ass hole!" He also said [redacted] had accused him earlier of stealing solar panels and had tried to get him in trouble at that time. b7

[redacted] was asked to display the sole of his boot to the interviewing Agents and at that time he turned his foot up and it was observed that the sole of his shoe had a design with the letters, "DEX." b7

[redacted] also advised that he was a licensed amateur radio operator. b7c

Investigation on 12/6/79 at Ada County, Idaho File # BT #52-5826

by SA [redacted] b7c Date dictated 12/10/79

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*Fig. 5. Report on FBI interview with second coyote hunter.*

*Photo C. The batteries for the transmitter.*

recommendation, and I have mine. In light of what I have seen as inaction and a do-nothing attitude on the part of the FCC, and to join with the efforts of many to bring about a streamlining of our government to reduce its overall cost, I summarily advocate Congressional action to eliminate the Federal Communications Commission from among the many branches of our government. If not, then at least the elimination of the enforcement division within that agency because, by its own admission, it prosecutes very, very few of the cases brought before it.■


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Peter S. Carr WB3BQO
329 Little Avenue
Ridgway PA 15853

# Sailplanes on Six

## — these thermal-hunting hams have an edge on the competition

What, besides a ham-fest, would get a ham out of bed at the crack of dawn to drive a hundred miles to stand around in dew-soaked grass with eighty or ninety other people? An R/C (radio control) sailplane contest, that's what! One contest in particular draws a very large turnout of these types to Faustown Park just outside York, Pennsylvania. It's the Lancaster Area Soaring Society's annual two-day meet which is held the first weekend after the Fourth of July.

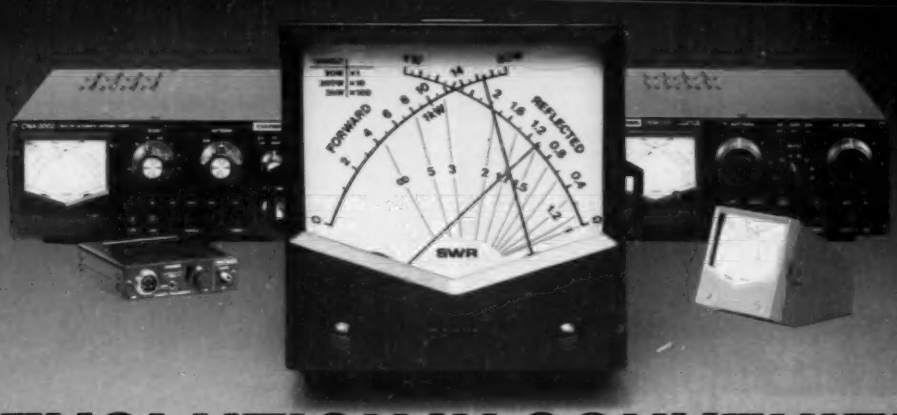
The pilots' meeting begins at nine sharp as the Contest Director outlines the flying task for the day. The "task" is the routine which each contestant and his plane will perform. This day, they will launch, drop the towline, and then fly the plane for exactly ten minutes before landing it inside a twenty-five-foot-diameter circle, right-side up and with no parts shed. Sound easy?

The aircraft are separated into four classes. Scale ships are miniature replicas of full-size planes, right down to the pilot figure and instrument panel. Planes of less than 100-inch wingspan have two classes, one for ships with just rudder and elevator controls and the other for ships using spoilers—which are like air brakes. The fourth group is called "Unlimited" because any plane with any number of controls and a wingspan of over 100 inches may compete in it.

After the pilots' meeting, the contestants break up and return to their planes to check them over before being called up to fly. Usually, a group of hams will gather to chat about the weather conditions, which repeater they used while driving to the Park, or the new FM R/C radio that one of them will be using. Hams usually make up about ten percent of all of the contestants, yet they manage to wind up near the top of the heap when the scores are

*Jeff Carr WB3CXC launches his Pierce Paragon sailplane at the 1980 League of Silent Flight Regionals. At age 16 his score was second highest overall and tops in Junior class. (The tow line is too fine to see.)*

*With the US Air Force Museum in the background, Peter Carr WB3BQO holds his 12-foot-wingspan Craftaire Sailaire sailplane at the 1980 A.M.A. Nationals Contest.*




# A REVOLUTION IN CONVENIENCE

**DAIWA announces an *all-new lineup* of high-quality amateur radio innovations.**

## Cross-Needle Meters CN-520 / CN-540 / CN-550

DAIWA cross-needle precision is now available in a compact case. Get forward power, reflected power and SWR readings at a single glance—from a meter that fits anywhere!

**CN520 - Frequency:** 1.8-60MHz • **Power range:** Forward 200/2kw, Reflect 40/400 watts • **Detection Sensitivity:** 40 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** 72W x 72H x 95D m/m

**CN540 - Frequency Range:** 50-150MHz • **Power Range:** Forward 20/200 watts, Reflected 4/40 watts • **Detection Sensitivity:** 4 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** same as CN-520

**CN550 - Frequency Range:** 144-250MHz • **Power Range:** Forward 20/200 watts, Reflected 4/40 watts • **Detection Sensitivity:** 4 watts minimum • **Accuracy:** ±10% at full scale • **Dimensions:** same as CN-520

## Active Audio Filter AF-306

By electronically filtering unwanted signals, the AF-306 gives you clean, distinguishable copy. Featuring its own internal speaker, the AF-306 Active Audio Filter is easy to install, easy to operate.

**Input:** 2.8v (4v max.) • **Output power:** 1 watt @ 8 ohms • **Distortion:** less than .2% • **S/N ratio:** better than 50dB • **Low Cut Filters:** 400Hz, 800Hz, 1100Hz • **High Cut Filters:** 1100Hz, 1600Hz, 2500Hz

## Automatic Antenna Tuner CNA-2002

Leading the way in convenience is the Daiwa CNA-2002 2.5 kW (PEP) Automatic Antenna Tuner. Cross-Needle Metering and optimum matching in under 45 seconds make it the perfect compliment to any state-of-the-art amateur station.

**Frequency range:** 3.5-30MHz including WARC bands • **Tuning Time:** less than 45 seconds • **Power rating:** SSB - 2.5kW PEP, CW - 1kW (50% duty), AM - 500 watts, RTTY, SSTV - 500 watts • **Output Impedance:** 15-250 ohms (unbalanced) • **Dummy Load:** 100 watts/1 minute (installed) • **Metering Ranges:** Forward power - 20/200/2000 watts, Reflected power - 4/40/200 watts, SWR - 1:1 - infinity • **Power requirements:** 11-16vdc @ 200ma

## Manual Antenna Tuners CNW-518 / CNW-418

The serious amateur wants to achieve the best antenna match possible. That's why DAIWA offers two manual antenna tuners that maximize power transfer—and offer cross-needle metering as well.

**CNW-518 - Frequency range:** 3.5-30MHz including WARC bands • **Power rating:** 1kw CW (50% duty) • **Output Impedance:** 10-250 ohms (unbalanced) • **Insertion loss:** less than .5 dB

**CNW-418** - Same as above except - **Power rating:** 200 watts CW

## Infrared Cordless Microphone RM-940

DAIWA ingenuity is also evident in the RM-940, an Infrared cordless mobile microphone system. Audio and transmit/receive switching are carried on a safe infrared beam. Experience the freedom of cordless mobile operation. Ask your Daiwa dealer for a demo today!

**Microphone:** Electret Condenser type • **Continuous Operating Time:** 5 hours minimum • **Charging time:** 8 hours max. • **Usable Distance:** 3.5 feet - microphone to sensor • **Power requirements:** Controller - 13.8 vdc Microphone - 2.5 vdc,@ 30 ma

## Speech Processor RF-670

DAIWA innovative thinking led to the development of the RF-670 Photocoupler Speech Processor. Its unique design gives your signal the boost it needs to cut through bothersome QRM. Get RF-type processing performance with the RF-670's economic photocoupler design.

**Clipping Level:** 20dB max • **Frequency response:** 300-3000Hz (-10dB) • **Clipping Threshold:** less than 2mV at 1kHz • **Bandwidth:** 2400Hz at 6dB down • **Distortion:** less than 3% at 1kHz, 20dB clip • **Output level:** 40mV max • **Mike imp.:** 600-50k ohms • **Power requirement:** 13.5v @ 60ma • **Dimensions:** 90 x 25 x 93 m/m

## UHF/VHF Mobile Antennas

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**DA500 - Gain:** 2.7dB at 146MHz, 5.5dB at 440MHz • **Length:** 960m/m • **Dual Band**

**DA100 - Gain:** 4.1dB • **Length:** 1,360m/m • 146MHz

**DA200 - Gain:** 5.2dB • **Length:** 1,870m/m • 146MHz

## Gutter Mount

**GM500 - Frequency Range:** 1.8MHz-500MHz • **Power Rating:** 1kw • **Dimensions:** 86W x 54H x 37D m/m

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**DAIWA**

**Amateur Radio Innovations**

451

*Bill Melske, a ham who hails from the New York area, launches his Craftaire Viking of 3-meter wingspan.*

*Don Goodwin WA2FRO puts his 100-inch-span Aquila on the tow line. The plane carries a Thermic Sniffler and is guided by an R/C rig on 53.3 MHz.*

counted. This is because they are better prepared.

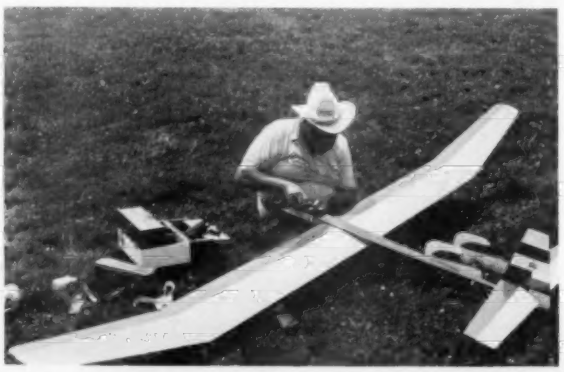
As each ham is called to the launch area to fly, he collects his transmitter from the Impound Table. (All transmitters remain impounded except when in use in the contest, avoiding jamming through accidental use.) It carries two colored streamers on its antenna; one color is black, denoting a six-meter operating band, and the other color shows which frequency it uses in that band. Also, most hams use a Thermic Sniffler, a telemetry system which senses temperature changes (indicating thermal currents) and radios them to the pilot. This rig operates in the low end of the two-meter band. The use of the six-meter uplink and two-meter downlink is restricted to hams with a Technician or higher-class license.

At the launch area, the ham connects his plane to the towline by a hook mounted on the bottom of the fuselage. He then moves up to the winch unit and steps on a foot switch. This engages a motor and drum assembly which winds in the towline and tows the plane into the air. At "top of the launch," about five- to six-hundred feet up, the line is dropped by radio command and the line falls to earth for the next launch. Meanwhile, the plane banks away to begin its search for lift.

Without finding a thermal, most sailplanes will fly no longer than about three and a half minutes. Finding these thermals is the basis of the contest, and the pilot's ability to locate and gain maximum height from each thermal is what the game is all about. A thermal is an invisible column of rising air which originates just above the earth.

A dark area such as a parking lot, farm field, highway, or the roof of a building absorbs more heat than its surroundings. This heat is passed to the air just above it and the air begins to rise. As this bubble of warm air rises, cooler air is drawn in to replace it and to

*Joe Bertin WD8PRG operates a winch-line retrieval system which returns the towline to the launch area for another launch.*



*Dave Burt of Indiana, Pennsylvania, adjusts the controls of his original design "Penn-Fli" 12-foot-span sailplane.*

# Here's a Concept You Haven't Seen In Amateur Radio For A Long Time— Low Price.

**The right design — for all the right reasons.** In setting forth design parameters for ARGOSY, Ten-Tec engineers pursued the goal of giving amateurs a rig with the right features at a price that stops the amateur radio price spiral.

The result is a unique new transceiver with selectable power levels (convertible from 10 watts to 100 watts at the flick of a switch), a rig with the right bands (80 through 10 meters including the new 30 meter band), a rig with the right operational features plus the right options, and the right price for today's economy—just $549.

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**New analog readout design.** Fast, easy, reliable, and efficient. The modern new readout on the ARGOSY is a mechanical design that instantly gives you all significant figures of any frequency. Right down to five figures (± 2 kHz). The band switch indicates the first two figures (MHz), the linear scale with lighted red bar-pointer indicates the third figure (hundreds) and the tuning knob skirt gives you the fourth and fifth figures (tens and units). Easy. And efficient—so battery operation is easily achieved.

**The right receiver features.** ***Sensitivity*** of 0.3 μV for 10 dB S+N/N. ***Selectivity:*** the standard 4-pole crystal filter has 2.5 kHz bandwidth and a 2.7:1 shape factor at 6/50 dB. Other cw and ssb filters are available as options, see below. I-f frequency is 9 MHz, i-f rejection 60 dB. ***Offset tuning*** is ± 3 kHz with a detent zero position in the center. ***Built-in notch filter*** has a better than 50 dB rejection notch, tunable from 200 Hz to 3.5 kHz. An optional noise blanker of the i-f type has 50 dB blanking range. ***Built-in speaker*** is powered by low-distortion audio (less than 2% THD)

**The right transmitter features.** ***Frequency coverage*** from 80 through 10 meters, including the new 30 meter band, in nine 500 kHz segments (four segments for 10 meters), with approximately 40 kHz VFO overrun on each band edge. ***Convertible power:*** 100 or 10 watts input with 100% duty cycle for up to 20 minutes on all bands. ***3-function meter*** shows forward peak power on transmit, SWR, and received signal strength. ***PTT*** on ssb, ***full break-in*** on cw. PIN diode antenna switch. ***Built-in cw sidetone*** with variable pitch and volume. ***ALC control*** on "high" power only where needed, with LED indicator. ***Automatic*** normal sideband selection plus reverse. ***Normal 12-14V dc*** operation plus ac operation with optional power supply.

**The right styling, the right size.** Easy-to-use controls, fast-action push buttons, all located on raised front panel sections. New meter with lighted, easy-to-read scales. Rigid steel chassis, molded front panel with matching aluminum top, bottom and back. Stainless steel tilt-up bail. And it's only 4" high by 9½" wide by 12" deep (bail not extended) to go anywhere, fit anywhere at home, in the field, car, plane or boat.

**The right accessories**—all front-panel switchable. Model 220 2.4 kHz 8-pole ssb filter $55; Model 218 1.8 kHz 8 pole ssb filter $55; Model 217 500 Hz cw filter $55; Model 219 250 Hz cw filter $55; Model 224 Audio cw filter $34; Model 223 Noise blanker $34; Model 226 internal Calibrator $39; Model 1125 Dc circuit breaker $10; Model 225 117/230V ac power supply $129; Model 222 mobile mount, $25; Model 1126 linear switching kit, $15.

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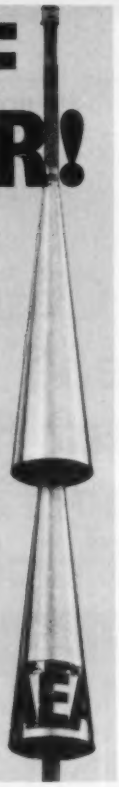


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be heated itself. This results in a column of air which leans over and drifts downwind while going up.

Since all this is invisible, the only way a pilot can tell if his plane is near one is to watch its movements. A sudden change of direction or wobbling of the wings means that the plane has entered the turbulent air around the thermal. If the plane is some distance from the pilot, identifying and staying with the thermal can be difficult. Hams have a better way. Their Thermic-Sniffler rigs send an audio tone of about 850 Hz, which indicates steady flight. When the plane enters a thermal, the tone rises—at a rate determined by the degree of the change in altitude. All else being equal, the higher the tone, the faster the plane will go up. If the plane hits a downdraft (colder air), a much lower tone alerts the pilot to steer away toward better air. By listening to the tone, the pilot can find a thermal, center the plane in it, and keep it centered as the thermal drifts downwind. This is obviously far more efficient than guessing from a thousand yards away.

Having worked the thermal for the required time, the sailplane is then flown back to the landing area. This part of the flight is very important and can add ten to fifteen percent to the pilot's total score. The landing circle has a length of tape nailed down at its center point, and scores are marked on it from 100 in the center to zero at the end. The plane must land as close to the center of the circle as possible, and the score is read where the tape touches the plane's nose.

Each pilot will fly four flights like this during the day. Because there are only seven R/C frequencies for non-hams, there is a long wait between rounds for those without an amateur ticket. Hams, on the other hand, have five R/C frequencies in the top of the six-meter band, and since there are fewer hams, this makes the wait between rounds much shorter for them. As the best lifts occur between 10:00 am and 2:00 pm, being able to choose when to fly is an added advantage for the ham.

At a large contest such as the one at York, the flying isn't completed until late afternoon, at which time the awards and trophies are passed out. It should be no surprise that hams take home a large share of the hardware. By using their electrical and mechanical skills to prepare the aircraft and their license privileges to operate them with confidence in the uplink control and efficiently through telemetry, they are well prepared, and scores show it. They also have the satisfaction of knowing all about their radios as well as their aircraft; they haven't just assembled store-bought items and made them work together in harmony.

The road home is made shorter by the chatter on the area repeater about missed landings, new model designs, better radios, and the feeling that win or lose, you have enjoyed the companionship of a great bunch of people.■

*Gene Shelkey from Scottdale, Pennsylvania, gets some help to launch his scale-model Schweitzer sailplane. It is an 11-foot span, 6½-pound flying weight craft complete with pilot figure and full interior.*

*Gerry Zeigenfuse from Eastern Pennsylvania flies his Pierce Paragon on six meters at the 1980 contest at York.*

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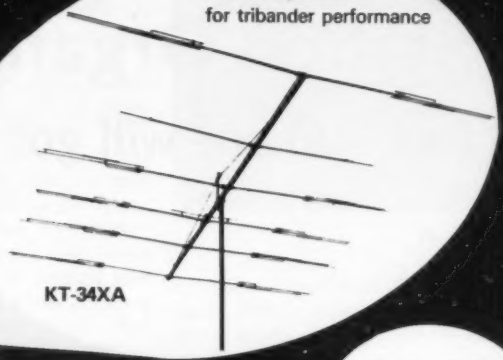

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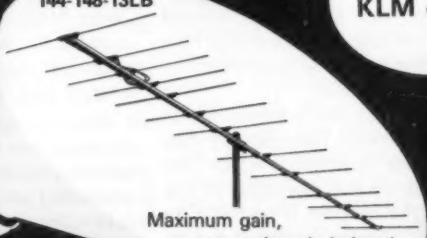

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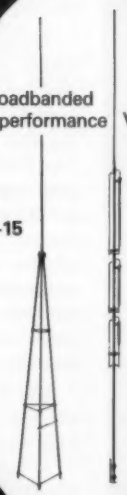

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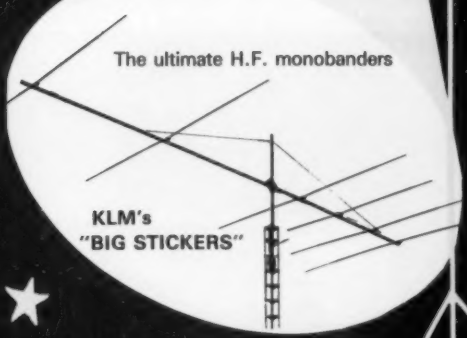

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# The Supernova Station Organizer

## — in this project, four into one will go!

*F.T. Marcellino W3BYM*
*13806 Parkland Drive*
*Rockville MD 20853*

It was on Roanoke Island, located near the Outer Banks of North Carolina, where I first met Dick Schultes WB2PEF from Cherry Valley, New York. Dick had brought his HW-8 plus tuner and bridge with a box of coaxial cable and antennas for a week of ham camping on the island.

Being thoroughly satisfied with the simplicity of operating the HW-8, I purchased one for my own camping usage. However, instead of WB2PEF's multiple-box station, I wanted just one additional box having as many conveniences as possible.

Thus, the Supernova was created. This device has four functions which enhance the operation of my QRP station. It contains an ac power supply, keyer, transmatch, and swr bridge.

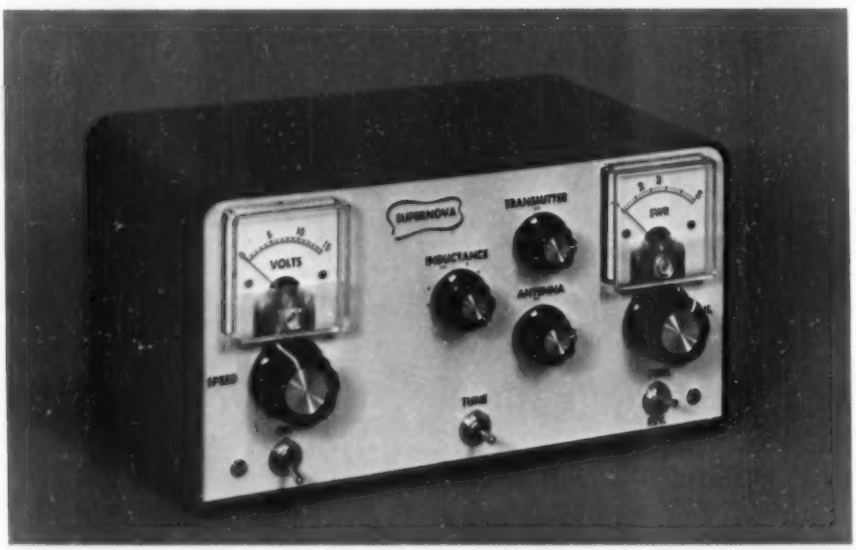


*Photo A. The completed Supernova.*

The keyer circuit uses the Curtis 8044 chip which is suitable for portable operation and readily adapts to a set of paddles.

The rf department was planned for use with a 40-meter half-wave dipole, center-fed with 50-Ohm coaxial cable. Multiband operation on 20 and 15 meters is aided by a built-in transmatch combined with a unique swr bridge.

Front-panel controls include a speed control for the keyer and a spring-return toggle switch for keying the rig during tune up. The FWD and REV selector and sensitivity controls are located under the swr indicator. The opposite side of the panel contains the voltmeter and power ON control, giving a well-balanced professional appearance to the panel.

The cabinet for the project was retrieved from my junk box and measures 8" × 4-1/2" × 4". The front panel and inner chassis were fabricated from scrap sheet aluminum. The transmatch and swr bridge were

shielded within a 3" × 4" × 5" minibox provided with a removable top section. The bottom section attaches to the inner chassis using sheet-metal screws. Rf input and output connectors plus a wing-nut ground terminal are mounted to the side of the bottom section. This bottom half of the minibox was modified by removing the front side to provide panel clearance for the transmatch and swr components.

The inner chassis was constructed with a rear-apron dimension of 7/8", which is sufficient to accommodate the various rear-mounted parts. These included: two 1/4" phone jacks for the keyer input and output, a twisted pair of #16 AWG wires 24" long with battery clips, fed through a 3/8" grommet for storage-battery operation, a DPDT toggle switch wired in parallel for selecting either battery or ac operation, and another twisted pair of the same size and length terminated with the HW-8 power connector. Next in line are the two fuses, one for protecting the battery circuit and the other the ac circuit. Finally, the input ac wires enter the apron through another 3/8" grommet. It was a tight fit, but I felt that all of these inputs and outputs plus other components were important to maintain complete control and flexibility from my QRP station.

For travel purposes, the three power cords can be coiled and stuffed into the back of the unit between rf box and the power transformer. In addition, the XYL contributed to the effort with a set of custom-made covers using some old towels. A close color match to the HW-8 was obtained by spraying the cabinet with #204 Ford-green engine enamel and the front panel with DS-GM #283 pastel green. These paints are available from your local automotive-parts outlet.

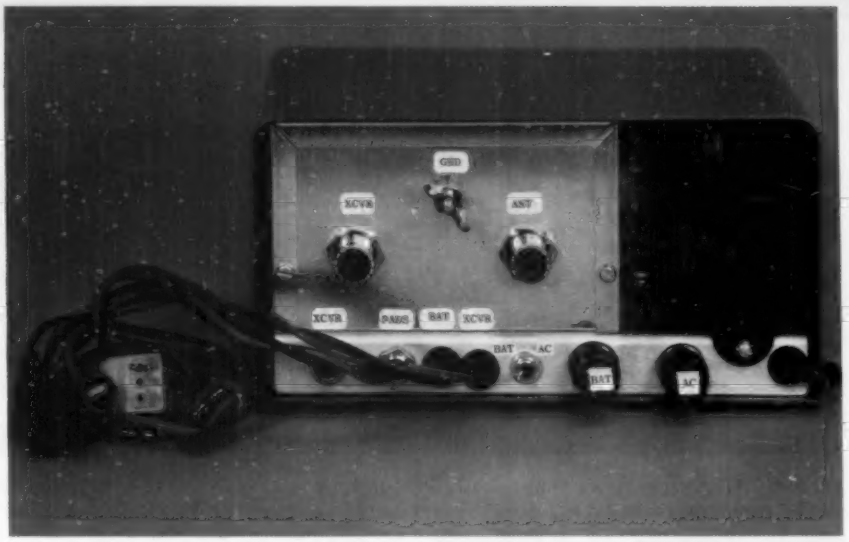


*Photo B. Rear view of the Supernova.*

**Power Supply**

The ac power supply is a standard circuit using a 12.6-V ac at 1.5-A transformer and a full-wave rectifier. With the capacitor-input filter, the input voltage to the LM340-15 regulator is about 17.6 V dc, giving a voltage differential of 2.5 V dc across the regulator. During keying periods, the voltmeter shows a steady indication very near 15 V dc. For good regulation and minimum ripple, a large amount of capacity was required, as shown in the circuit diagram.

The plus 15-V dc regulated voltage is connected to the rear-panel selector switch. Notice that the voltmeter is wired to the arm of the switch. This allows monitoring of either the ac-supplied 15 V dc or the storage-battery voltage.

**Keyer**

I'm accustomed to using a set of paddles in my shack, so I made this a requirement for my QRP rig. I chose the Curtis 8044 chip because of its compactness and low operating power. See Fig. 1.

Since the HW-8 has its own sidetone generator, there was no need to use the 8044's generator circuit. Therefore, pins 11, 12, and 13 were not used. The supplied data sheet showed Vdd max to be 10 V dc. This presented a small problem since I would be using either 12 or 15 V dc. A one-Watt, 8.2-V dc zener and a series resistor provided a simple solution.

The output of the 8044

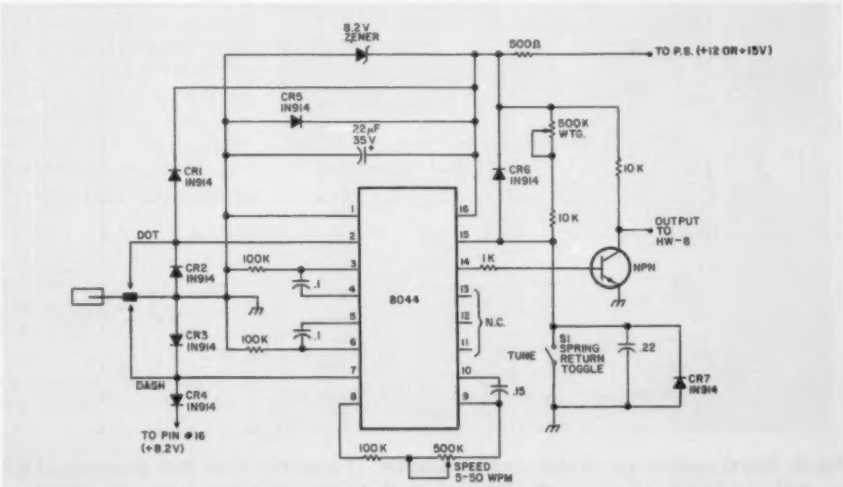


*Fig. 1. Keyer circuit.*

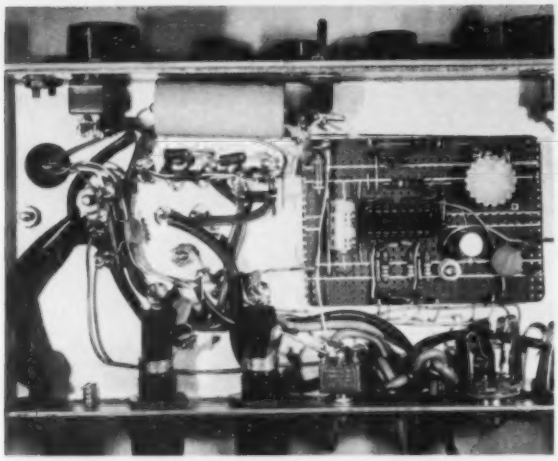

*Photo C. This bottom view of Supernova shows the power supply components on the left and the keyer parts on the right. Across the bottom are the various inputs and outputs.*

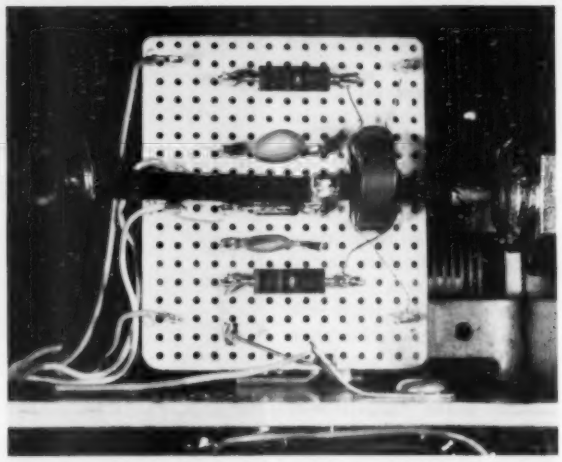

*Photo D. This view of the swr bridge shows the main rf wire covered with black insulation. Notice the wire reversal on the lower winding.*

drives an ordinary NPN transistor on the keying line. When either the dot or dash paddle is active, the collector of this transistor will transfer from 8.2 V dc to near ground potential thereby turning on the transmitter. Notice that only one keying wire is required to the HW-8. The other connection is supplied by the power ground wire.

The circuit for the keyer shows several diodes. *Do not* omit these diodes—they have a definite purpose. As stated in the Curtis data sheet,[1] this chip uses CMOS technology; and although not stated in the data sheet, the device could be susceptible to electrostatic discharge (ESD). Admittedly, the level of zapping voltage may be higher than for an unprotected MOS device, but you nevertheless should exercise caution during handling.

I recommend that the entire keyer circuit be fabricated using all the diodes called for, and with all wiring to jacks and power supply completed, prior to inserting the 8044 into its socket. Photo C shows the parts layout which I used. The weight control is board-mounted and adjustable through a hole in the case bottom.

When you are ready to install the chip, place the palms of both hands on the chassis. This will discharge any accumulated body charge and place you at the same potential as the chassis. Remember that after removing the chip from its black conductive foam, it becomes vulnerable to ESD damage.

Next, grasp the chip on its bare sides (*never* the lead sides) and install it into the socket. These are relatively simple precautions that could save your device from damage. Personally, I'd rather use a little caution than mail another sixteen bucks to Curtis Electro.

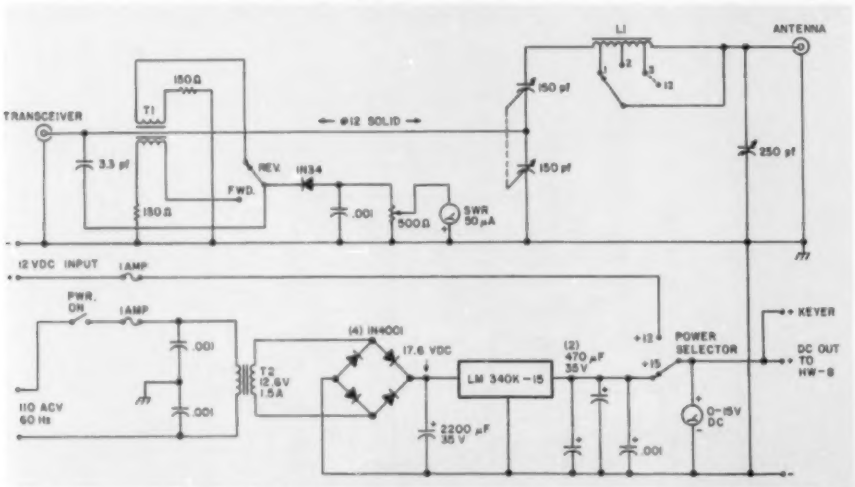


*Fig. 2. Power supply, swr bridge, and transmatch. T1 uses two three-turn windings of #28 enamel on a Fair-Rite Products #638MT-L core. Windings are laid on in the same direction. L1 consists of 30 turns of #18 enamel on an Amidon #T-106-2 core.*

**Swr Bridge**

The swr-bridge circuitry is a modification of a circuit which I've used in the past on some CB equipment.[2] All components are attached to a piece of perfboard mounted in the rf box. The main rf conductor, a #12 AWG wire, is secured to the board and serves as the board mount when soldered into the rf connector. See Photo D for details.

This circuit requires two 3-turn windings on a toroid core to form a transformer with the main rf conductor. Once the windings are phased properly, a SPDT toggle is used to transfer the indicator circuit from FWD to REV. Both windings are wound on the core in the same direction using #28 enamel-covered wire.

Phasing is done by reversing the two wires for the REV winding. The bridge components were arranged in an orderly fashion with no great concern given to bridge symmetry. The bridge has been checked against my commercial swr bridge with no difference detected at QRP levels.

### Transmatch

This circuit is a basic transmatch configuration[3] using a broadcast transistor transistor-radio dual capacitor, a standard single-gang capacitor, and a core inductor. See Fig. 2. The inductor was constructed using 30 turns of #18 enamel-covered wire with 12 taps, spaced about every two turns. An air inductor could be used, but it would occupy considerably more space. The diameter of the completed core inductor approximated the size of the ceramic wafer on the rotary switch. This proved to be beneficial because after bending the switch solder lugs parallel with the wafer, wires from the 12 taps slipped into the lugs. See (Photo E) for details.

### Operation

The Supernova is simple to operate and, when combined with the HW-8, the two units become inseparable. Whether in my home shack or in some remote location, I have experienced a satisfaction that only a QRP operator could appreciate.

When placing my station on the air, I have found that time is saved by first tuning up the HW-8 into a dummy load on the band of my choice. With the swr bridge set to read reflected power, adjust the transmatch for a minimum indication. Use the sensitivity control to maintain meter deflection near midscale for these initial adjustments. For maximum transfer of rf power, use the least amount of inductance while tuning for a 1:1 match.

When you have obtained the best possible match, switch to FWD and set the meter to full scale. While the transmitter is still keyed readjust the loading control on the HW-8. The power meter on the rig will peak, with simultaneous peaking of the swr meter, indicating proper rf coupling to the antenna. The sensitivity control may now have to be reduced somewhat to maintain the full-scale reading. The correct swr ratio can now be read when the switch is placed in the REV position.

The Supernova has performed better then expected. The transmatch loads the 40-meter dipole with near 1:1 ratios on 40, 20, and 15 meters. In the evenings when 20 and 15 are open, I can work from coast-to-coast with respectable signal reports. I have operated the two units from my 12-V dc storage battery or commercial power. The ability to transfer between power sources proved very convenient during unscheduled power outages.

I designed the Supernova to enhance my HW-8 while keeping component cost at a minimum and operation simple. I believe these goals were satisfied, and hope I've contributed in a small way to the big thrill of QRP communication. ■


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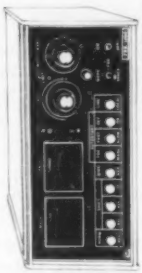

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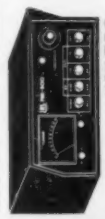

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#### References


1. 8044 Keyer Data Sheet, Curtis Electro Devices, Inc., revised February 23, 1979.
2. "High Sensitivity Swr Meter," *Popular Electronics*, October, 1979.
3. "The Super Transmatch," *73 Magazine*, July, 1976.


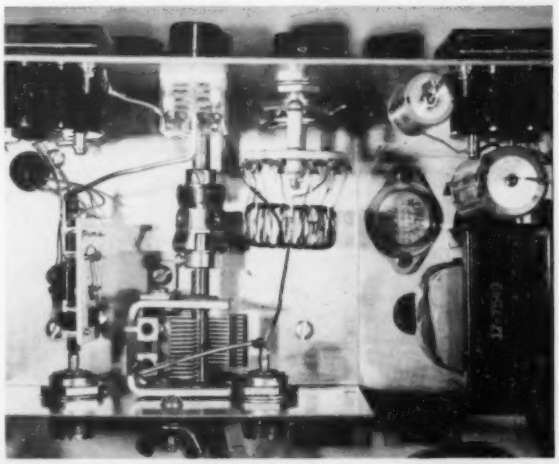

*Photo E. This top view shows the swr bridge on the left in the same box with the transmatch. The ac power supply parts are on the right side with two of the large filters.*

#### Component Sources

T1—#638MT-L, Fair-Rite Products, available for $1 and an SASE from William Vancura, 4115 35th Ave., Moline IL 61265.

L1—#T-106-2, Amidon Associates, available for $1.50 plus $1.50 shipping. Amidon Associates, 12033 Otsego St., North Hollywood CA 91607.

Keyer-On-A-Chip—#8044, Curtis Electro Devices, Inc., available for $14.95 plus $1.75 shipping direct from the factory: Box 4090, Mountain View CA 94040.

*Jeff DeTray WB8BTH*
*Tim Daniel N8RK*
*73 Magazine Staff*

# Kenwood's TR-9000

## — the multi-mode 2-meter rig that's making SSBers out of VHFers

If we had to choose one word to describe Kenwood's TR-9000, a multi-mode two-meter transceiver, that word would be *flexible*. In two months of use, we have put this rig to the test as an FM station at home, made it a mobile traveling companion, and used it to enjoy the fun of SSB mountaintopping. All this flexibility comes in a box that is no bigger than most conventional FM-only units.

### Tuning, Scanning, And Searching

Each TR-9000 user will discover a favorite way to select operating frequencies. You can use the main tuning dial, stepping across the band in 100-Hz, 5-kHz, or 10-kHz steps. The same thing can be accomplished with the up and down switches on the microphone. If operating is confined to a handful of frequencies, then the memory channels may be preferred. There is even a special oddball channel that allows you to use nonstandard repeater splits.

Three types of searching and scanning can be used. "Autoscan" is an FM-only means of scanning the entire band. If a signal is present, the scanning stops and then restarts when the signal drops. Pushing either the hold switch or the PTT switch returns the rig to normal operation. The second kind of scanning is "free scan," in which the band is swept without stopping. Another version of free scan gives the user "search" capability in the SSB and CW modes. A 10-kHz segment is repeatedly searched in 100-Hz steps. That way you will be aware if there is any activity on what might otherwise be a dead band.

The ten front-panel controls devoted to frequency selection take some getting used to, but the remaining seven knobs are self-explanatory. They give you RIT, volume control, squelch, etc.

*Kenwood's TR-9000.*

### Looking Inside

Before giving the details of what we liked and disliked about the TR-9000, it might be worthwhile to look at the rig's innards. There are eight circuit boards, filling almost every available square inch of space. The frequency selection and control blocks fill three of the boards. The majority of the remaining circuitry is found on the transmitter and receiver cards. Three smaller boards hold the transmitter power amplifier, carrier oscillator for SSB/CW, and sidetone oscillator.

The TR-9000's flexible frequency selection stems from the use of a 6500-based microprocessor system. The magic takes place in one chip that contains the memory, central processor, and much of the support circuitry. The microprocessor has sixteen data lines that drive the phase-locked-loop unit where the frequency synthesis takes place.

The contents of the microprocessor's memory are lost if the power is disconnected, requiring the user to reprogram his favorite frequencies. If the rig is

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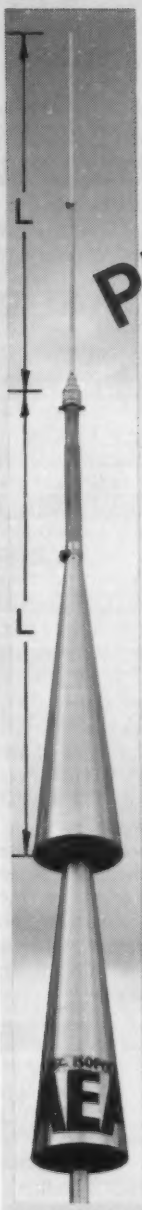


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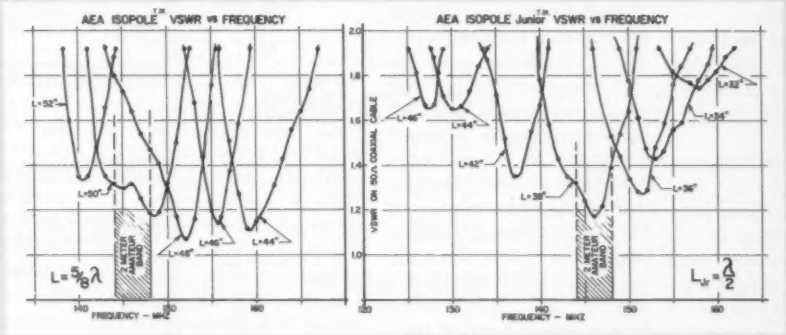
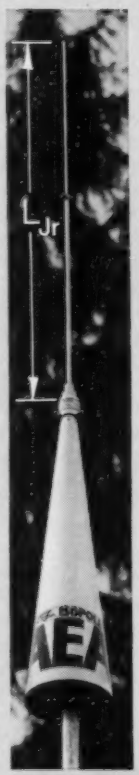
All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane and present an unsightly bird's roost with an inevitable "fallout zone" below. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other, when used with SWR protected solid state transceivers. **Typical SWR is 1.4 to 1 or better across the entire band!**




Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. The insulating material offers superb strength and dielectric properties plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is **not supplied**)

Operating on MARS or CAP? The IsoPole and IsoPole Jr. antennas will typically operate at least ± 2 MHz outside the respective ham band without re-tuning. However, by simple length adjustment, the IsoPoles can be tuned over a wider range outside the ham bands.

Our competitors have reacted to the IsoPole, maybe you should too! Order your IsoPole or IsoPole Jr. today from your favorite Amateur Radio Distributor. For more information on other exciting AEA products, contact Advanced Electronic Applications, Inc., P.O. Box 2160, Lynnwood, WA 98036. Call 206/775-7373 ✓ 2

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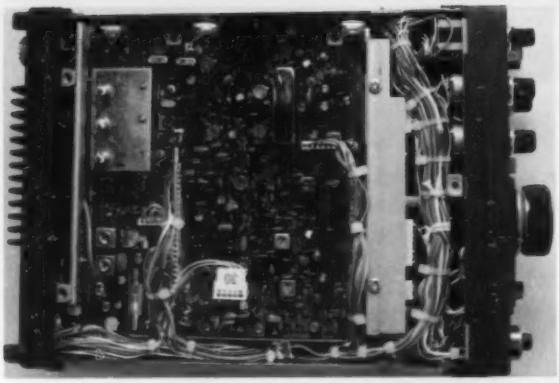
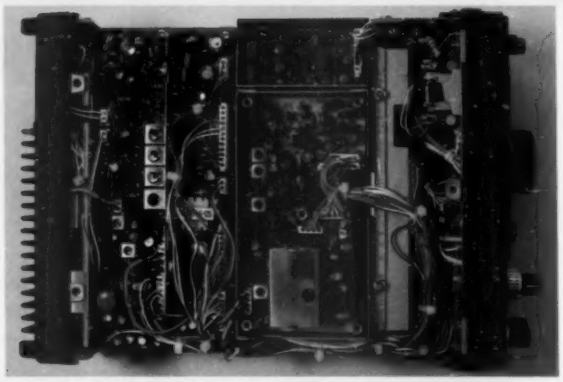


*Bottom view of the TR-9000.*



*Top view of the TR-9000.*

connected directly to a battery, the TR-9000's computer will keep operating even if the power switch is in the off position. This backup function consumes about 2.5 mA, so the rig can be left in the car for several weeks without causing appreciable battery drain. Since the computer is always on, it is important that the radio be disconnected before the vehicle is jump-started or an external battery charger is used.

A close examination of the TR-9000's schematic revealed that cost-cutting measures had been held to a minimum when the rig was designed. Unlike some of the earlier all-mode two-meter rigs, Kenwood's latest whiz-bang box has separate filters for SSB and FM. The dual-conversion receiver for FM offers one level of selectivity, while the single conversion SSB/CW circuit has a narrower bandwidth. This allows you to have your cake and eat it, too.

CW operation is enhanced by a "fast" agc that automatically returns to a slow constant when the rig is switched to SSB. A noise blanker is available for SSB or CW receiving and helps to reduce the plague of impulse ignition noise. Another SSB/CW-only feature is the RIT, which offers as much as 1 kHz of plus and minus offset. Transmitting on CW can be awkward since the T-R switching must be done with the microphone's push-to-talk switch or with a "standby" switch of your own devising. Accommodations for full or semi-break-in CW operation are not to be found.

The TR-9000's transmitter circuitry features a preset microphone gain for SSB operation. The alc and mike gain circuits are factory aligned for a "normal" voice and may need some tweaking by the operator who whispers or shouts into the microphone. Unfortunately, the instruction manual only shows where the controls are located—not how to adjust them. A rear-panel connector is provided for FM operators who desire to use a touchtone™ pad. An 8-volt supply is available at this connector when the rig is in the FM mode.

The TR-9000's final power transistors provide 10 Watts of output in the high-power FM and CW modes and approximately 10 Watts PEP out for SSB. The energy-saving low-power position reduces the output to slightly more than a Watt. Our tests showed these power levels to be consistent from 143.3 to 148.7 MHz, allowing MARS and CAP coverage.

Like other radios using solid-state finals, the TR-9000 employs a protective circuit that reduces the transmitter's output power when the antenna is something other than a nominal 50-Ohm load. Our tests showed that no appreciable power reduction occurred until the swr exceeded 2:1.

The instruction manual that accompanies the TR-9000 is in keeping with the tradition of providing basic operational instructions and little else. The six methods of frequency selection and searching are described with moderate clarity, but it takes several minutes of study and experimenting to get the hang of things. The manual's text is supported by a number of drawings that show the do's and don'ts of installing the rig. Information about servicing is nonexistent except for warnings not to play with the radio's insides. A service manual is available, however.

We previously noted that operating the TR-9000 involves some compromises, especially in the SSB and CW modes. Perhaps an explanation is in order. Until recently, multi-mode two-meter rigs were scarce and expensive. VHF diehards relied on receiver and transmitter converters. This meant tying up an HF station and dealing with cabling and switching hassles. The benefits of this approach include a more sophisticated receiver and the opportunity to have VOX, variable mike gain, and similar goodies. Which approach is better? That depends on your needs.

For *73 Magazine* staffers who have a drive-up mountain ten minutes away, the all-mode radio was the answer. Most of the time it resides in a mobile setup, being used on the local repeaters. When the two-meter SSB bug hits, we toss a small beam into the car and head for the mountain. In no time flat, we are having a blast talking to SSB ops up and down the eastern seaboard. Future plans call for the TR-9000 to be pressed into service as part of an OSCAR satellite station. We can't vouch for the rig's applications in weak-signal work like moonbounce or scatter, but it does do a good job of meeting our FM and mountain-topping needs.

**Odds and Ends**

Several matching accessories can accompany your TR-9000. The PS-20 is a 12-volt power supply, good for 4.5 Amperes. A matching external speaker, the SP-120, is a nice addition for fixed station operation, as is the system base, B0-9. It has a memory backup power

***Continued on page 101***

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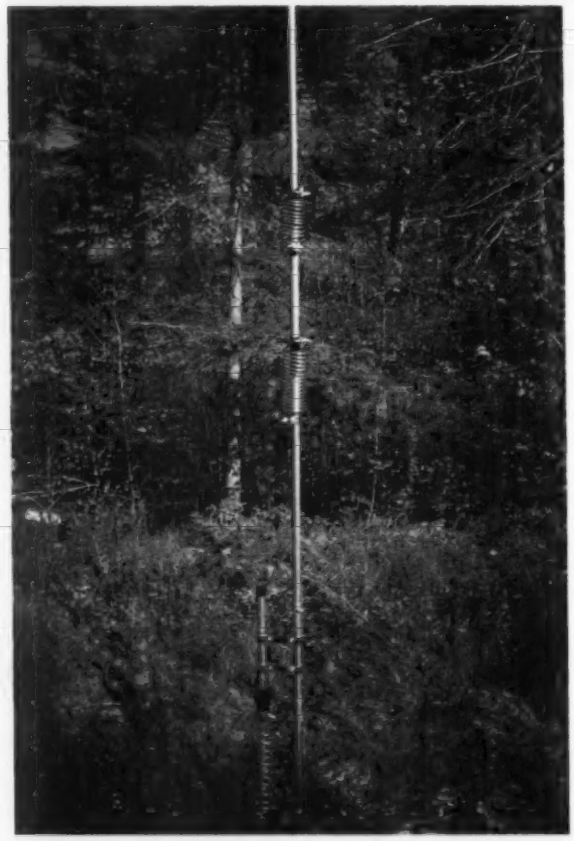
Paul Grupp KA1LR
73 Magazine Staff

# Butternut's HF5V-III Vertical

## — this one really does work equally well in all directions

The trap vertical antenna is an oft-maligned radiator of rf, but, in truth, it has a few things going for it. It is ideal for the beginner who wants to sample the activity on all the bands without making his backyard look like the high-wire act at the circus or spending a lot of money. Properly installed, the vertical can even be reasonably effective! Truly, the trap vertical is not just for beginners. A roof-mounted vertical is often the only answer for hams with a shortage of real estate who crave 160-, 80-, and 40-meter operation. The low angle of radiation of a vertical has better DX-catching potential than a dipole, and contesters have found the vertical to be excellent for checking activity off the back and sides of a directional array. Many a long-path DX opening has been missed because a station did not do this sort of checking! I frequently use a vertical to make sure that my beam is headed in the right direction. Flip back and forth between the beam and the vertical—if the other station is stronger on the vertical, you are pointing the beam in the wrong direction.



*The Butternut HF5V-III vertical antenna.*

Once you have a vertical, you'll think of lots of ways to use it. As the sunspot cycle plunges 10 meters into oblivion, you might want to consider taking down that tribander, replacing it with four- or five-element monobanders for 15 and 20 meters. On the rare occasion when 10 is open in the bottom of the sunspot cycle, the vertical will allow you to sample the action. Meanwhile, you'll be enjoying the superior characteristics of the large monobanders on 15 and 20, assured that you aren't missing much on torpid ten!

Some time ago, I installed Butternut HF5V-III vertical antennas in two separate locations—one roof-mounted at the *73 Magazine* ham shack for contest spotting and Novice use and the other ground-mounted at home to serve as my main antenna system until I amass the fortune necessary for a tower and beam.

### Why the Butternut?

I chose the Butternut antenna for two reasons. Trap vertical antennas have relatively narrow bandwidth on 80 and 40 meters and must be set for lowest swr in the most often used portion of the band. This is a reasonable compromise, unless you operate in both CW and phone bands, as I do. With many verticals, retuning for different portions of the band is annoying at

*Continued on page 131*

# The 2ATouch

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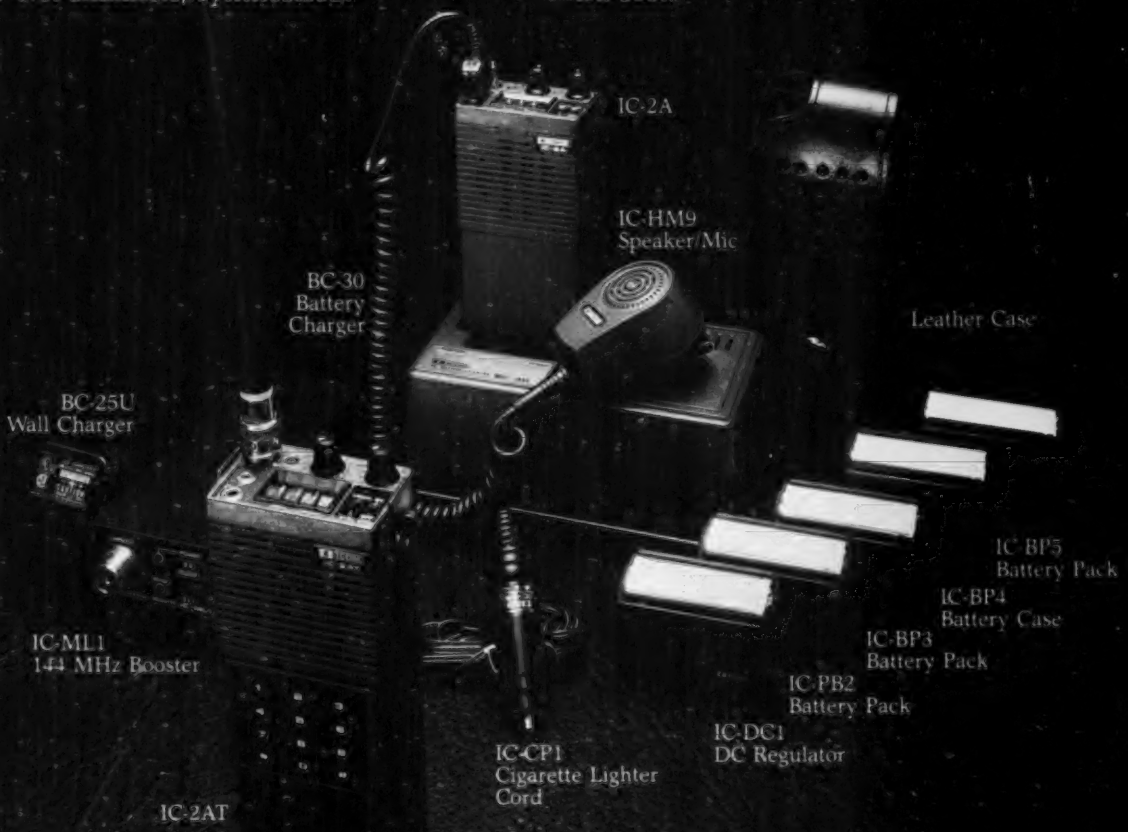


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# The Meterless Ohmmeter

## —an audible continuity tester

The subject of this article is an audible low-voltage, low-current, and low-cost continuity tester. The tester is also small enough to put in your shirt pocket because it uses a 35mm film container for an enclosure. Originally I had a need for such a tester during a project that was wire-wrapped and I needed to check a lot of connections in as short a time as possible. The tester will give you an audible indication of resistance up to around 2000 Ohms. You can test semiconductor junctions with it and the tester will let you tell the difference between just a few Ohms of resistance because different tones will be heard when testing different values of resistance. Since this continuity tester will let you measure small values of resistance, it is nice for testing any sort of wiring or semiconductor components.

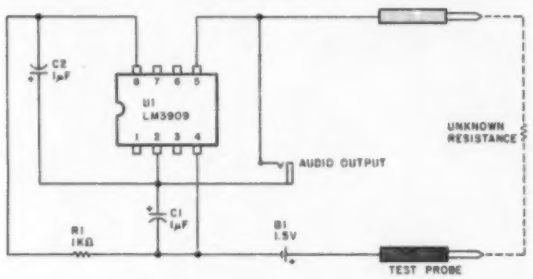


*Fig. 1. Continuity tester schematic.*

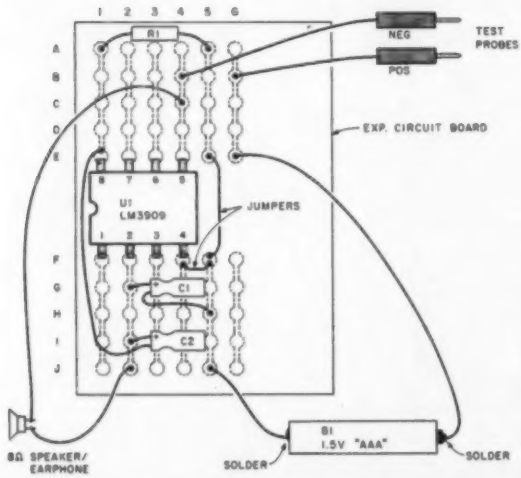


*Fig. 2. View from top of circuit board.*

The LM3909 used in this tester is almost indestructible provided it isn't fed with more than 1.5 volts. I use an AAA-size 1.5-volt battery in my tester and it has lasted almost a year now. The tester provides enough voltage to turn on transistor and diode junctions and it does so at low current levels. Maximum current levels are obtained when the component being measured has close to zero Ohms of resistance. If you use a 1000-Ohm earphone with the tester, the current will be approximately 2 mA. If you use an 8-Ohm speaker, the current will be around 13 mA. If you're not measuring zero Ohms, the current through the component or wire being tested will be in fractions of a milliampere. The enclosure used for my continuity tester was an empty film container and it is just the right size to put in your pocket and get ahold of when you need it. If you don't have a 35mm camera, ask one of your friends that does to give you an empty film container.

Construction of this continuity tester will only take an hour or so if you have all the parts ready. You can buy all the parts at a Radio Shack store. Depending upon what you have in spare parts and your junk box, the total cost will be from five to ten bucks.

The electrical design of the continuity tester is shown in Fig. 1. If you look at Fig. 2, you can see how the parts are placed on the piece of experimenter circuit board. A completed continuity tester is shown in Fig. 3. Looking at Fig. 1, you should notice that the earphone or speaker has to be connected for the tester to operate. If you don't use an earphone and jack as I did, you might want to install an on-off switch to turn the tester off in case the test

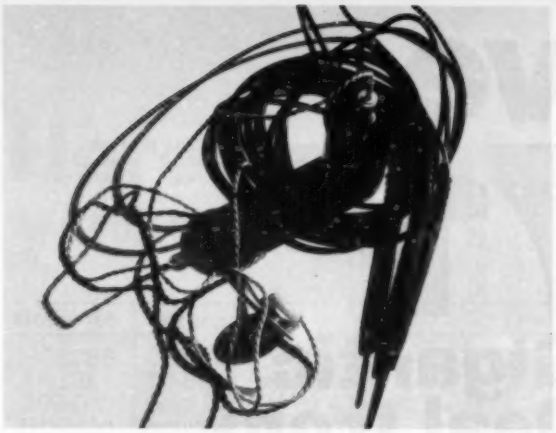

Fig. 3.

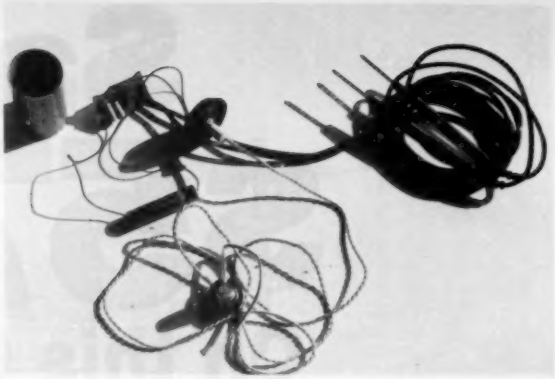

Fig. 4.

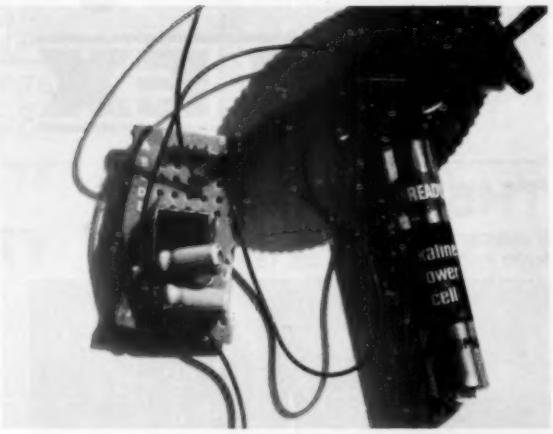

Fig. 5.

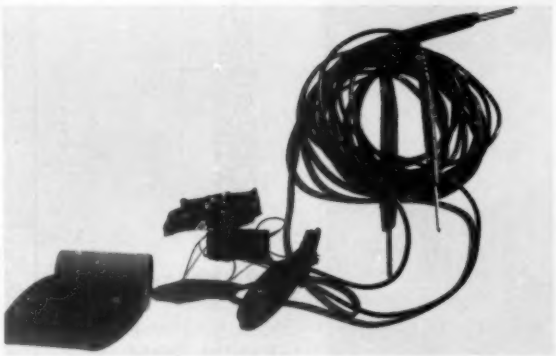

Fig. 6.

leads touch together while it is waiting to be used.

Before you solder the parts in place on the circuit board, trim it down enough to fit into the film case. Then drill two holes in the lid of the film case and pass the test leads through it. Fig. 5 is an example of my trimmed down circuit board. The capacitors used in my tester were electrolytics rated at 50 volts, but any rating small enough to fit on the circuit board and into the film case would work just as well. The voltage rating needs to be only a few volts, so tantalum capacitors would work nicely, too. After you have soldered the components to the circuit board, drill a hole in the center of the film container top for the earphone jack (if you use one) and install it. Finally, solder the leads going to the battery and touch the test leads together. You should hear a tone coming from the earphone or speaker, depending on which you used. At this point, your continuity tester should look like Fig. 4.

If you have some low values of resistance handy, try the tester on them and listen to the different tones generated by different values of resistance. When you're sure that the tester is working correctly and all the wires are soldered, wrap the circuit board and the battery with electrical tape to prevent things from shorting out once you put everything into the film case. Take a look at Fig. 6—you can see what my tester looks like before stuffing everything into the film case. Now that you've got the audible continuity tester put together, you can use it to check wires and semiconductors. By connecting it to a telegraph key, you've got a code practice oscillator. If you replace the earphone or speaker with the correct value of resistor (between 10 and 2000 Ohms) and take an output from across it, you have an audio signal generator, the output frequency depending upon the resistance that you use. ■

**Reference**

National Semiconductor Corp.
Linear Applications Vol. 2
AN-154
Santa Clara CA 95051

**Parts Suppliers:**

Global Specialties Corp.
70 Fulton Terrace
PO Box 1942
New Haven CT 06509

Jameco Electronics
1355 Shoreway Road
Belmont CA 94002

**Parts List**

| | |
|---|---|
| C1 and C2 | 1-uF/15-volt electrolytic capacitors |
| R1 | 1000-Ohm, 1/4-W resistor |
| U1 | LM3909 flasher oscillator |
| B1 | 1.5-volt AAA-size battery |

Miscellaneous:
Circuit board (Radio Shack 276-170, Global Specialties Corp. EXP-300), Test probes, 35mm film container, speaker or earphone and jack, wire, solder.

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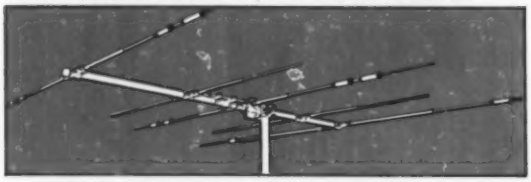

The installation of a ham's first directional antenna system is a memorable event because of the substantial improvement in the capability of the station. You really have to experience using a directional array at your station to appreciate the thrill of improved performance.

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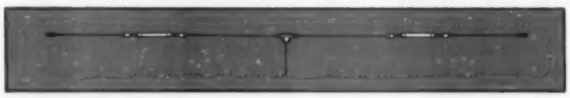

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| 2DBQ | Trap Doublet for 40 to 80 meters | 59.95 |
| HDR300 | Rotator | 499.95 |
| HG10 | 10 foot mast | 56.00 |
| HGCOA | Coax Arms (3) | 39.00 |
| BN86 | Baluns (2) | 31.90 |

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73 Magazine Staff

# QRM-Free Antenna Tuning

## —with this inexpensive noise bridge

One definition of the word "relaxed" is "being at rest or at ease." The way to achieve that state when working with antenna tuning problems is definitely to use a noise bridge. Compared to the anxiety and frustration which usually develop when feeding power into a tuning system for protracted periods, you can experiment for hours using a noise bridge and not worry about components heating up or having to vary the power level back and forth to get an swr meter to read properly as tuning conditions change.

Besides, you also do the rest of the amateur fraternity a favor by not radiating a lot of needless QRM. Any amateur who does not have such a permanently established antenna and antenna tuning system that operation is merely a matter of always presetting tuning controls on each band might well consider the noise-bridge idea.

The noise bridge is a versatile device and can be used for various functions involving impedance measurement as well as antenna tuning. However, it is probably most useful for antenna tuning work, so just that aspect of its application will be emphasized. The basic idea of the noise bridge is just like that of most bridges. That is, as shown in simplified form in Fig. 1(a), when the arms of the bridge are balanced, the detector will not have any output.

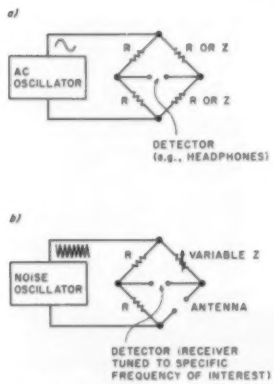


*Fig. 1. In a conventional bridge circuit (a), the oscillator generates a specific frequency which is detected for a null when the bridge is balanced. In a noise bridge (b), multiple frequencies are generated and the detector provides selectivity so the bridge can be balanced for a null at the frequency of interest.*

Usually, the detector used is not frequency selective: The ac oscillator used, be it in the af or rf range, generates a specific frequency and the detector is a broadband device (like a pair of headphones) which responds to any oscillator frequency being used. As shown in Fig. 1(b), the noise-bridge idea just exchanges this scheme—the oscillator becomes a broadband frequency-generating device, and a frequency-selective detector is used.

In the noise-bridge scheme, the noise generator generates rf noise (a voltage which is a random function of time) over the HF range and a communications receiver tuned to the frequency of interest becomes the detector. When the arm marked "variable Z" in Fig. 1(b) has the same value as that connected to the terminals marked "antenna" at a specific frequency, the noise level (as heard in a receiver tuned to the same frequency) would theoretically be zero. In reality, because of leakage and imperfect components, the received noise is not zero, but it dips to a distinct null as the "variable Z" arm is varied in value around that of the impedance connected to the "antenna" terminals.

The circuit of the noise bridge is shown in Fig. 2. A 6.3-volt zener is used as a noise source and its noise output is amplified by a simple three-stage amplifier. There is nothing particularly critical about the components used. The only item that requires a bit of care in construction, although it is hardly difficult to do, is the output transformer. Care must be taken to obtain good balance between the windings.

The transformer is wound on an Indiana General CF 102, 3/8" ferrite core or on an Amidon T-50-2 core. These items were formerly a bit difficult to obtain but are now readily available from a number of mail-order sources. In fact, Amidon will sell direct and accepts small orders (Amidon Associates, 12033 Otsego Street, North Hollywood CA 91607).

A slightly larger or smaller core also can be used as long as the core is made of a ferrite "mix" intended for the HF range. Four 5" lengths of #28 enameled wire (or any near gauge) are first twisted together along their entire length. One neat way to do this is to insert each wire in a hole on perforated board stock

leaving just enough wire exposed to grip the ends. Then, twist the board and gradually pull the wires back out of the board.

It doesn't cost much to practice this technique a few times and extremely neat results will be obtained. The "quadrifilar" winding on the core is then produced by simply taking the twisted wire bunch and winding it on the core to produce 4 to 5 turns. Space the turns evenly around the core and hold them in place with a bit of clear glue or coil dope. The ends can be marked before winding the transformer or located after using an ohmmeter.

Connect any two windings together to form the primary and the other two together to form the secondary. Take care, of course, to get the windings polarized correctly as shown by the dots next to the windings in Fig. 2.

The circuitry can be assembled on any small PC board using point-to-point or isolated-pad-type wiring. I assembled the circuity on a 2-1/4" × 1-1/2" board. My usual technique in assembling a circuit of this sort where short lead lengths are desired and where really no complex circuitry is involved is just to follow the schematic during construction. That is, components are soldered in place one by one as compactly as they can be placed following the schematic from left to right.

A PC board larger than required is used and, after assembly is finished, the PC board is trimmed to size with a fine handsaw. I also mounted a small trimmer-type capacitor and potentiometer on the board. This was only done for test purposes. In practice, you would normally want to have these components (the 100-Ohm potentiometer and series 140-pF capacitor shown in Fig. 2 which constitute the variable impedance arm of the bridge) as panel-mounted controls.

The circuitry can be mounted in any small enclosure which can contain the circuitry, a battery, and two coaxial connectors for the antenna and receiver terminals. A shielded one is preferable but not absolutely necessary.

The panel-mounted variable capacitor and potentiometer deserve a word of mention. If an air-variable capacitor is available it can be used, but experience has shown that even the cheap transistor radio variables are quite satisfactory and very inexpensive. The same is true of the potentiometer which has to be a linear-taper, carbon-composition type.

An unshielded type is desirable to avoid stray capacitance. In some cases, the metal back cover on a potentiometer can be removed. One can find PC-mount trim potentiometers which are completely unshielded and which can be turned into a panel control by means of a nylon extension shaft. They are very inexpensive but ideal for this type of application.

If you want to use the noise bridge as a calibrated instrument, first connect a 50-Ohm composition resistor to the "antenna" terminals and use a communications receiver tuned to 10 or 15 meters as a detector. As the capacitor and potentiometer are varied, a noise null should occur around the midpoint of their shaft rotations.

Different value resistors above and below 50 Ohms can then be used to calibrate the resistance potentiometer. Various value capacitors below 68 pF and in series with a 50-Ohm resistor are used to calibrate the capacitor rotation. The capacitor rotation on one side of its noise null (as established with just a 50-Ohm resistor as a load) will indicate capacitive reactance while the other side will indicate inductive reactance.

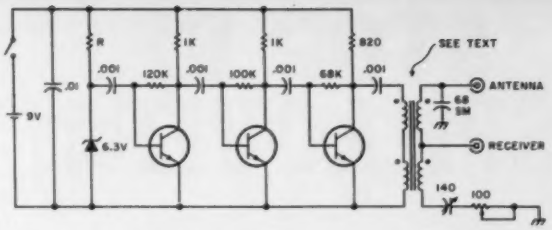


*Fig. 2. Complete basic noise bridge. The resistor, R, is chosen for maximum noise output using any given 6.3 volt zener. Start with a value of about 1K Ohm. If the variable RC components on the output have their rotation calibrated, the bridge can be used to directly measure complex impedances over the range of 160-6 meters. Transistors are 2N5129 or HEP or Radio Shack equivalents.*

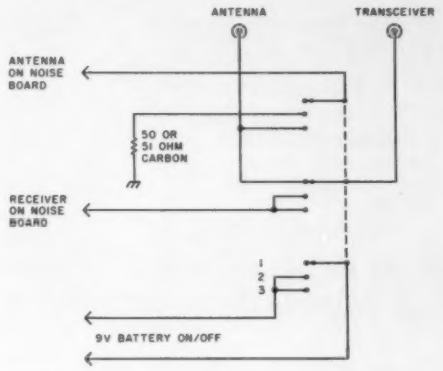


*Fig. 3. Some additional switching circuitry makes the noise bridge more versatile and easier to use if you are primarily interested in only 50-Ohm load adjustments. Switch positions are: 1—off (bypass); 2—test (calibrate); 3—on (operate).*

Following the above procedure, you can develop a nicely calibrated test instrument to measure complex impedances. I have had such an instrument in use for several years with very good results. However, most amateurs really don't measure complex impedances very often.

The main advantage to a noise bridge for most amateurs is that it allows the leisurely setting of antenna tuners or other matching devices to provide a 50-Ohm load to a transceiver. In such cases, by adding an extra switch and resistor to the basic noise bridge one can develop a simple, self-calibrating noise bridge. The switching arrangement shown in Fig. 3 allows the noise bridge to be bypassed (with the battery switched off), switched to a 50-Ohm "calibrate" position, or switched into operation.

I assembled my 50-Ohm noise bridge in a 4" × 2" × 1-1/2" enclosure.

The PC board is just held in place by stiff wiring to the side-mounted variable capacitor and potentiometer. The battery is held in place by back-to-back adhesive tape, although a proper holder is recommended. The 3P3T switch is at the top of the enclosure between the two coaxial connectors.

Rather than using two SO-239 female connectors, one connector was made from a UHF-type male connector. So, this arrangement saves having to use an adapter when inserting the bridge.

The male connector is mounted by means of a reducing adapter (for either RG-58 or RG-59) which fits the UHF male connector. A lock washer is threaded on the adapter which is too small to pass over the end flange of the adapter. The hole in the enclosure is made just large enough to pass the threaded diameter of the adapter. With the adapter inserted from the inside of the enclosure, the male connector is screwed on to it from the outside.

In operation, the noise bridge is first calibrated by switching to the 50-Ohm "test" (calibrate) position and adjusting the side controls (which are unmarked) for a noise null. Then you can switch to the "on" (operate) position for hours of leisurely testing (well, at least up to 7 or 8 before the battery will give up).

The side controls are, of course, not touched, and whatever device is being tested or adjusted is varied until the same noise null is obtained as with the 50-Ohm calibrating resistor. The "off"—or bypass—position is useful when you want to apply power to check that a 50-Ohm load has indeed been achieved for a transceiver. ■


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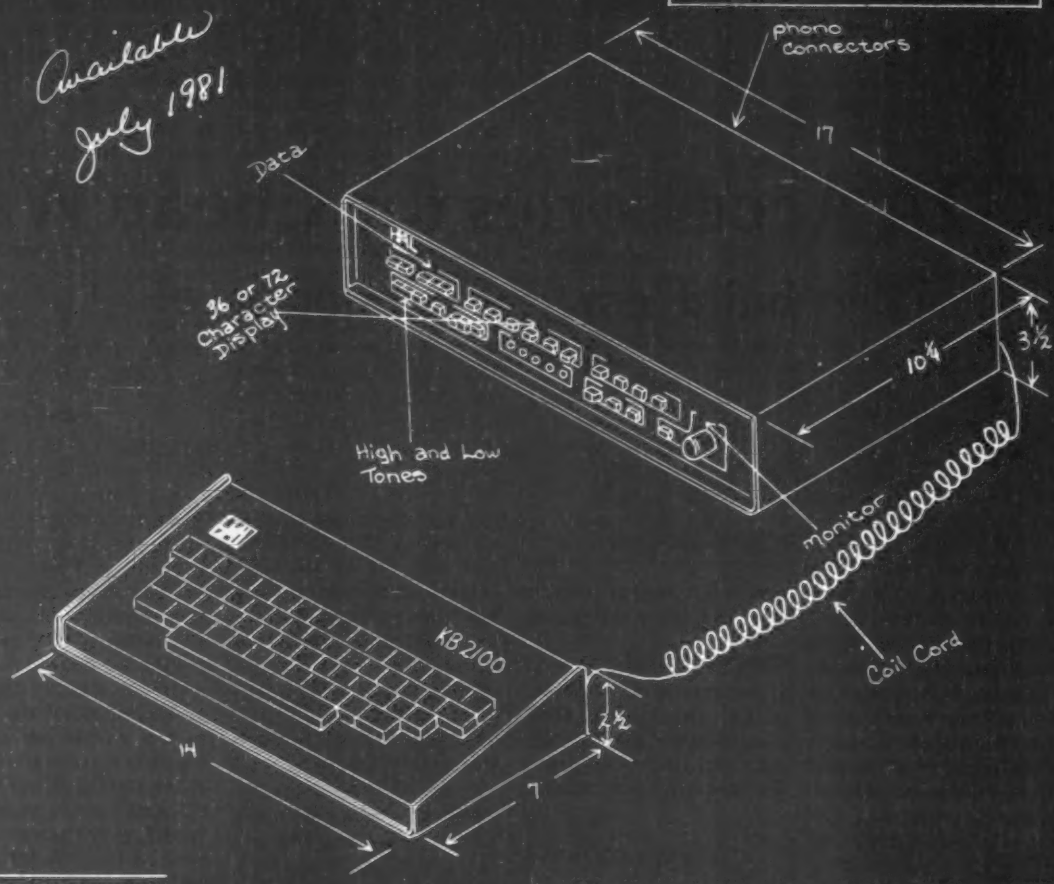


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# IC-2A Accessories the Cheap Way

## — build 'em yourself and save!

The Icom IC-2A has been on the market only a short period of time, yet it is already starting to look like it is going to be one of the most popular handie-talkies to hit the market. This article details a few easily built or acquired accessories which will further enhance the flexibility of this fine rig.

### Remote Microphone

For mobile and belt-carrying use, an external microphone is a real nicety. You can easily fabricate a lightweight microphone with push-to-talk that fits the hand perfectly. First, accumulate the following parts:

- A single-conductor shielded guitar cord, coiled, available from Radio Shack (RS 42-978), which sells for $5. There's easily enough cord for two microphones, so split this with a friend.
- An electret condenser microphone element available from either Radio Shack ($3.00) or Bullet Electronics ($2.00).
- An SPST momentary contact miniature push-button switch. Radio Shack sells 5 for $2.50.
- A 24k-Ohm ¼-Watt resistor.
- A Polaroid "Print Coater" case. This is the small plastic case that the print-coating applicator supplied with Polaroid film comes in.

First, clean out the Print Coater case with soap and water. You can throw away the cap, as this won't be used. Now, punch a hole in the bottom of the case to take the coil cord, and cut a slot in the side of the case one inch long which has a width equal to the diameter of the shank of the push-button switch you are using. Don't mount the switch at this time. Pull one end of the coil cord through the Print Coater case and wire the coil cord, switch, resistor, and microphone element as shown in Fig. 1.

Note that only the power and shield connections to the microphone element are used. The audio output center conductor is taped up and not connected to anything. The audio feeds into the IC-2A through the power line of the condenser element.

With everything wired up, slide the push-button switch down the slot and fix in place with its locknut. Push the microphone element into the end of the case and secure in place with Silastic compound

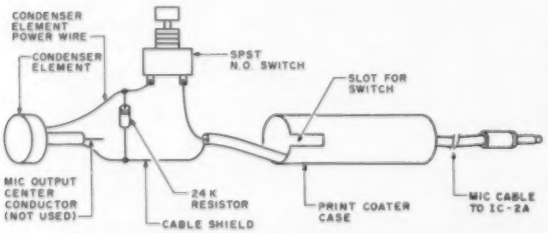


*Fig. 1. PTT microphone details.*

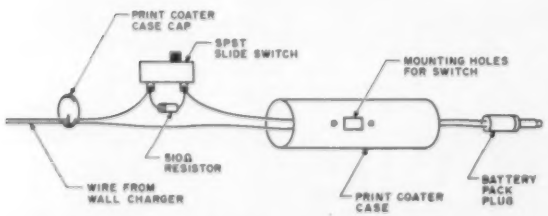


*Fig. 2. Wall charger trickle adapter.*

(available at any hardware or drug store). Also, fill in any extra gap in the case with the Silastic compound.

Finally, mount the subminiature microphone connector supplied with the IC-2A on the free end of the guitar cable. Voila! You now have a great remote microphone. Pushing the PTT switch both completes the microphone circuit and causes the IC-2A to switch to transmit. This is accomplished by a clever bias circuit within the IC-2A which permits a remote microphone with push-to-talk using just a center conductor and ground. This remote microphone sure makes mobile operation easier and the price is right!

### Trickle Charger

The wall charger that comes with your IC-2A charges the batteries at a 50-milliamp/hour rate. However, like any nicad battery, battery damage can occur if you overcharge the batteries. The recommended charge time is 16 hours for a completely discharged battery. It is also recommended that you discharge the batteries completely each time since nicads can develop a memory based on less than full discharges. Since minor things like work and sleep sometimes keep me from being around at the end of a 16-hour period, I felt that it would be beneficial to be able to trickle-charge the batteries during these times. Since trickle-charging will not harm a nicad, you can leave an extra battery pack on a constant trickle-charge to ensure a fully-charged battery pack when you need it. The recommended trickle-charging rate is approximately one percent of the battery Ampere-hour capacity. For the standard 250 mAh IC-2A nicad pack, this will be 2.5 milliamps. Your IC-2A wall charger can be converted to a switchable trickle/normal charger for less than one dollar. You will need the following: one 510-Ohm ¼- or ½-Watt resistor, a miniature SPST slide switch (Radio Shack sells two for 79 cents), and a Polaroid Print Coater case (remember this?).

First, wash out the Print Coater case with soap and water. Next, cut a cross in the bottom of the case and push through the wall charger connecter. Pull about a foot or so of cord through the case. Now notch the case cap so as to pass the cord. The mounting holes for the miniature slide switch are now cut in the side of the Print Coater case. The switch will mount from the inside of the case, but don't mount it yet. First cut one of the wires of the charging cable. Now wire the 510-Ohm resistor, SPST switch, and charging cable as shown in Fig. 2. Slide the SPST switch into the Print Coater case and snap the case cap in place. The SPST switch now either shorts out the 510-Ohm resistor for normal charging or permits the 510-Ohm resistor to stay in the line for a 3-milliamp trickle-charge rate. The LED charging indicator in the 250-mAh battery pack will not light with the 3-milliamp trickle-charge rate, so I use the status of this indicator to tell me if the charge switch is set to the normal or trickle state. I think that you will find this to be a very worthwhile modification to the wall charger. The total time required for this modification is less than ½ hour.

### 12 V dc Power Cord

An inexpensive 12 V dc charging cord which includes a cigarette lighter plug on one end and the same plug which mates with the IC-2A battery pack on the other end is available from Radio Shack. It is an RS 270-1533 and sells for $2.99. A useful addition to this cord is the trickle/normal switch modification just described. This permits you to keep a battery pack trickle-charging in the car all the time.

### K-Mart Karrying Kase

Finally, I found an Instamatic camera carrying case at K-Mart which fits the IC-2A almost perfectly. The only size problem had to do with the camera case being three-fourths of an inch too long. I compensated for this with a ¼-inch wood spacer. The beauty of this is that the IC-BP4 450-mAh battery pack will extend the length of the IC-2A by exactly ¾" permitting this case to be used with either battery pack. A little care with an X-acto® knife over a period of about one hour will leave you with a very professional looking case complete with all cutouts. In addition, I also sewed a couple of leather loops to the side of the case to hold both the flex antenna and a collapsible 19-inch antenna purchased separately. The PTT switch is easily pressed by squeezing the case. Incidentally, the price of this case was $3.67!

I've described several inexpensive accessories for the IC-2A. I am sure that you can continue along this line with others. For example, a real speaker/mike complete with touch-tone™ pad built into an old CB microphone is in the planning stages. I'm also working on an inexpensive remote speaker/amplifier box for mobile operation. I'll have more on these at a later date. I think that you will find that with a little work, you can easily build many of the desired accessories for your IC-2A. ■


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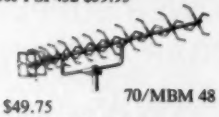

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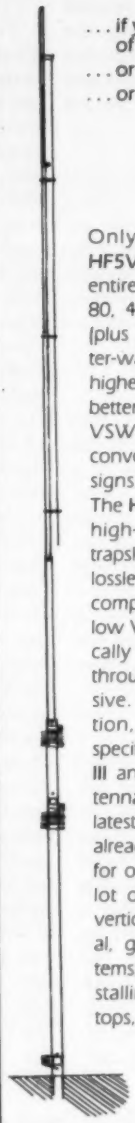

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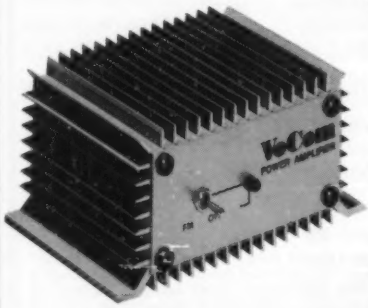


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Louis Berman K6BW
1020 Laguna Avenue
Burlingame CA 94010

# Solar-Powered Alignment Tool

## —using Old Sol to find true North

Two common methods of calibrating the direction of a beam antenna with respect to true north (or south) are: to align the boom in the direction of the polestar, or to apply the variation correction to the magnetic north (or south) reading of a compass. Unfortunately, there is no accommodating star at the south celestial pole for observers in the Southern Hemisphere. The variation correction depends upon one's latitude and longitude.

The method I shall describe here is simpler; it is based upon the sun's meridian passage at any locality in the world. All one needs to know is one's approximate longitude obtained from a world map and the local mean time (LMT) of the sun's meridian transit. At this moment, the sun is at its maximum altitude and is on a north-south line. Table 1 lists the LMT of the sun's meridian passage on the first, tenth, and twentieth of each month. These values do not vary by more than about one minute from year to year.

Since our clocks are based on standard or zone time and not on local time, it is necessary to apply a longitude correction, converted to time units. Table 2 allows this, to the nearest standard meridian. The standard meridians theoretically are spaced 15° apart to the east or west of the Greenwich prime meridian. If the station longitude is east of the standard meridian, subtract the difference in longitude in time units between your station and the nearest standard meridian from the LMT; if the station longitude is west of the standard meridian, add the longitude difference in time units to the LMT. Thus, standard or zone time = LMT plus or minus the difference. Because the time zones have ragged boundaries, it may be necessary to add or subtract one hour, and, in some instances, one-half hour, as the custom dictates.

To demonstrate the simplicity of the solar method, two examples are chosen.

(1) What is the standard time of meridian passage of the sun at longitude 114° 20′ W on October 15? From Table 1 we interpolate a value of 1145 LMT. The nearest standard meridian is 120° W. The difference in longitude between the station and the nearest standard meridian is 5° 40′. From Table 2, this amounts to 23 minutes. Since the station is *east* of the standard meridian, the Pacific standard time of the sun's meridian passage is 1145 − 0023 = 1122 PST.

(2) What is the standard time of meridian passage of the sun at longitude 25° 40′ E on March 25? From Table 1, LMT = 1205. The difference in longitude between the station and the nearest standard meridian of 30° E is 4° 20′, which from Table 2 is equivalent to 17 minutes. Since the station is *west* of the standard meridian, the standard time of the sun's meridian passage is 1205 + 0017 = 1222.

At the standard time the sun is on the meridian, that is, due north or south, depending on your latitude, line up the antenna boom with the sun or parallel to any shadow cast by a vertical structure (pole, tower, etc.). An error of 4 minutes in time amounts to a change in the direction of the sun of only 1°. Set the direction indicator of your rotator to 0°. Make certain that the radiating element of the antenna is on the correct side of the boom—otherwise you could be 180° off. That's all there is to it! ■

| Date | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1202 | 1213 | 1211 | 1203 | 1156 | 1157 | 1203 | 1205 | 1159 | 1149 | 1143 | 1148 |
| 10 | 1207 | 1213 | 1209 | 1200 | 1155 | 1159 | 1204 | 1204 | 1156 | 1146 | 1143 | 1152 |
| 20 | 1210 | 1213 | 1207 | 1158 | 1156 | 1201 | 1205 | 1202 | 1153 | 1144 | 1145 | 1157 |

*Table 1. LMTs of sun's meridian passage. These times basically correspond to the sun's transit over the Greenwich meridian, taken from the* American Ephemeris and Nautical Almanac. *Because the sun's apparent eastward daily motion is of the order of 1° or less, the slight difference between the Greenwich and the local mean time of the sun's meridian transit may be neglected.*

| Arc | Time (minutes) |
|---|---|
| 0° 00′ | 0 |
| 0° 15′ | 1 |
| 0° 30′ | 2 |
| 0° 45′ | 3 |
| 1° 00′ | 4 |
| 1° 15′ | 5 |
| 1° 30′ | 6 |
| 1° 45′ | 7 |
| 2° 00′ | 8 |
| 2° 15′ | 9 |
| 2° 30′ | 10 |
| 2° 45′ | 11 |
| 3° 00′ | 12 |
| 3° 15′ | 13 |
| 3° 30′ | 14 |
| 3° 45′ | 15 |
| 4° 00′ | 16 |
| 4° 15′ | 17 |
| 4° 30′ | 18 |
| 4° 45′ | 19 |
| 5° 00′ | 20 |
| 5° 15′ | 21 |
| 5° 30′ | 22 |
| 5° 45′ | 23 |
| 6° 00′ | 24 |
| 6° 15′ | 25 |
| 6° 30′ | 26 |
| 6° 45′ | 27 |
| 7° 00′ | 28 |
| 7° 15′ | 29 |
| 7° 30′ | 30 |

*Table 2. Difference of longitude conversion.*

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# The DX Primer

## —low power plus low antennas plus good technique equals 300 countries

One of the things that many amateurs look forward to the most when they upgrade is the prospect of being able to work some DX with their new privileges. Novices especially look forward to being able to operate on better DX frequencies and on 20 meters. However, many of these would-be DXers are discouraged right from the start.

Because they have heard that 20 is the best DX band, they listen to the stations in the "kilowatt alley" on that band from about 14.200-250 MHz. These stations all seem to be running a full kilowatt (at least) and a four- or five-element beam at about 70 feet or more. They are always giving out 59+20-dB reports to DX stations which the newcomer can't even hear with his modest transceiver and dipole at 25 feet. The newcomer listens for awhile, decides that DXing is a game for wealthy fanatics, and heads for two meters or for a rag-chew on 75 SSB.

He has been too hasty, though, for it is quite easy to work DX with that 100-Watt transceiver and a low-slung dipole. It takes some patience and some special techniques, but it can be done. I worked my first 100 countries with 20- and 15-meter dipoles 10 feet high and a barefoot transceiver. I worked 262 countries before I got an amplifier and worked 310 countries before any of my antennas were higher than 29 feet.

In many European countries, amateurs are limited to about 200 Watts of power, and yet stations from those countries constantly show up on the honor roll. So, it is possible.

### Equipment

Before discussing some of the techniques for low-power DX chasing, at least a little should be said about equipment and antennas. The most important parts of your station when it comes to working DX are, in order: antenna, receiver, transmitter. The antenna is by far the most important factor in determining how successful you will be at DXing. It does not matter how expensive or marvelous your receiver is, it can't receive signals that aren't fed into it, and it is the job of the antenna to pick those signals up and to send them to the receiver. Likewise, it doesn't matter how much power your transmitter runs and how clean and pure your signal is; if your antenna won't radiate that signal out of your backyard, then you aren't going to work any DX.

So, you should put up the best antenna you possibly can. We are already assuming here that you cannot get an antenna up very high. If that is so, then what antenna is best? There is no single answer to that question, and this is not meant to be an article on antennas. I do have some general advice, however. If at all possible,

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put up a gain antenna, and put it up as high as you possibly can. I worked my first 310 countries on dipoles and a three-element 20m yagi that I bought for $27 and put up on a TV tower at 29 feet. Look through the antenna books and the magazines and find articles on gain antennas you can construct. If necessary, use a fixed wire antenna, but get some gain if you can. For 10, you can pick up "retired" CB antennas for a song and recut them so they'll work on 10. In most cases, that involves cutting a few inches off the elements until you get the antenna resonant on 28 MHz.

Many old-timers will tell you that if you can't get an antenna up high, you should use a vertical because it has a lower angle of radiation and is, therefore, better for DX work. While this may hold true on 40 and on 80, where a dipole a half-wavelength high has to be 60 or 120 feet, respectively, it is not true on 20, 15, and 10. On 10, a dipole one-half wavelength high has to be only about 15 feet up. I had a good friend in Texas who worked the world on 10 with a little four-element yagi eight feet off the ground. My advice for the "higher" bands is that you put up a gain antenna if at all possible, and if not, put up a dipole as high and as clear as you can. Verticals will work fine on these bands for DX, sometimes better than a dipole, but they have two main disadvantages: 1) they are susceptible to QRM from all directions, and 2) they are considerably more susceptible to man-made noise—line noise, auto ignition, your neighbor's hair dryer, etc. I like verticals for 160, 80, and 40, but on the higher bands, dipoles seem to do the job as well or better.

Regardless of what type of antenna you put up, it should be carefully tuned so that it is resonant on the frequency you will be using most often. Also, it should be put together carefully. Wire connections and coax connectors should be soldered, tubing and pipes should be scraped and bonded together, etc. In short, anywhere where metal joins metal, the connection should be clean and solid. If you are going to use an antenna at a low height, you must ensure that it radiates and receives every Watt possible, rather than losing that precious power in bad connections, leaks to ground, faulty coax, etc.

Once you have your antennas in good shape outside, you should then concentrate on the gear you have inside. Even the most modest equipment is capable of working DX, but not if it is out of alignment or full of "soft" tubes. Unless you are sure that your gear, especially the receiver, is in perfect alignment, realign it yourself (the manual should tell you how), have a friend do it, or return it to the factory.

If you have tube-type equipment, replace at least the most critical tubes for receiving: the rf amplifier tube and the i-f stage tubes. Even though your receiver may sound like it's working OK, you might be surprised at how much "hotter" it becomes with new tubes. Save the old ones for spares.

Make sure that all of the contacts and interconnections in your shack are clean and well-soldered, especially those having to do with antenna and ground connections. An oxidized antenna connector might let rf through when you transmit and, thus, not show up on your swr meter, but it can seriously degrade receiver sensitivity, especially with weak DX signals.

There are several station accessories that you should consider if you want to chase DX. One is a good pair of headphones. Not only will they help ensure domestic tranquility, they will also help you hear weak signals under poor conditions better than you can through a speaker. You can get a good pair of 8-Ohm stereo headphones fairly inexpensively these days.

If you hear a lot of hum and hiss when you plug them into your receiver, you probably have an impedance mismatch. Many receivers have headphone jacks with impedances in the 500-2000-Ohm range. To match these to 8-Ohm headphones, you can buy an audio transformer at Radio Shack for a buck or two. Put it in the audio line so the 8-Ohm side goes to the phones and the higher impedance side goes into your headphone jack (you can even wire the transformer internally onto the jack). This should eliminate the mismatch-induced noise and will make headphone reception much more pleasant.

While we're on the subject of audio, you should also consider an audio filter for reception. Audio filters are available for as low as $30, and they can greatly improve the performance of a receiver, especially an inexpensive or moderately priced one. If you contemplate using mostly CW, you can get one of the CW-only filters; if you're going to work SSB, too, then you should consider one of the continuously variable filters. An audio filter will help improve your receiver's selectivity and will allow you to notch out QRM and to pull through those weak ones.

Yet another valuable accessory is an automatic keyer. Most DX pileups on CW are conducted at high speed (don't let that worry you; all you have to send and receive is your callsign and report). It is tough to send 20-30 wpm with a straight key for an hour or two in a pileup, and a keyer makes it much easier.

Finally, you might consider a speech processor of some kind. If you are running barefoot, the processing will give you several dBs of average gain, and this will definitely help under weak-signal conditions and in pileups. However, do not adjust the processing level too high (as most people do). It is tempting, but you will create splatter on adjacent frequencies, rob your audio of intelligibility, and possibly damage your transmitter.

**Techniques**

Now, you've got your antennas and your equipment ready. How do you work the DX? There are three main variables you need to consider: What mode will you operate? What band will you operate on? What time of day should you operate?

In general, the beginning DXer or the low-power DXer will do much better on CW than on SSB. There are two major reasons why this is true. First, CW is the better mode under weak-signal conditions, and it tends to be something of an equalizer under good conditions. On bands that are only marginally open, you can often make CW contacts when SSB contacts are virtually impossible. And, because of variations in the receiving station's frequency and pitch, your chances of getting through on CW when conditions are good will be better. Second, there is less competition on CW. There are fewer people tuning the band looking for DX than on SSB, and, thus, your chances are much greater of finding a rare one without anyone else calling. And the pileups are generally smaller and much easier

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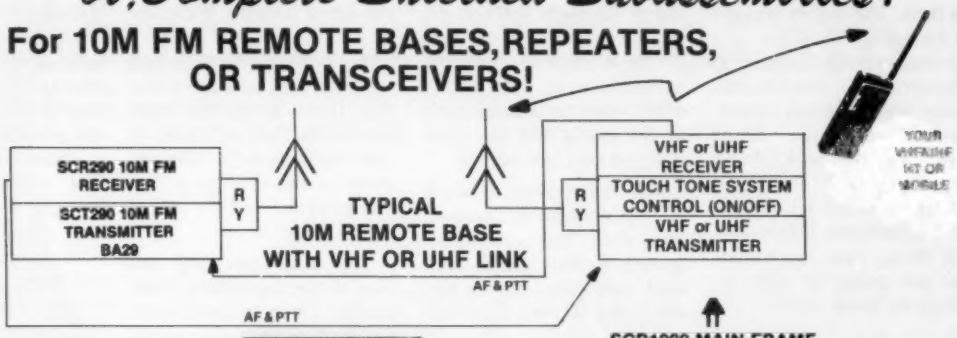
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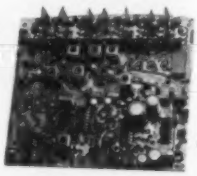

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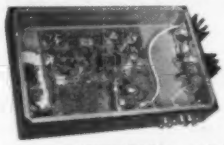

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to get through. So, at least to begin with, you are probably going to do better on CW than on SSB.

Which band do you work? A good rule of thumb is to operate on the highest band that is open at any given time. The higher you get in frequency the less trouble there is with QRN, solar absorption, man-made noise, and harmonic broadcast interference. Right now, near the peak of the sunspot cycle, 10 and 15 are the best bands for low-power, low-antenna DXers. For one thing, your low antennas are going to perform better on those bands.

To be of optimum effectiveness, a gain antenna usually needs to be one wavelength high. This is 66 feet on 20, but it is only about 33 feet on 10. You are going to have a lower angle of radiation on 10 and 15 than on 20, and, therefore, you are going to work DX better. There is less competition on 10 and 15 than on 20, and these bands tend to be "equalizers." For some reason, the difference between a kW and a barefoot exciter is often almost negligible on 10.

So, each time you get on to chase DX, check 10 and 15 first; if they're open, stay there. These bands tend to be best in the wintertime; conditions slack off a little in the summer. Also, they are primarily daytime bands, especially 10. You will rarely work DX on 10 and 15 before sunrise or for very long after sunset, although it does happen occasionally, especially on 15. For a year or two at the sunspot maximum (where we are now), these bands are often open all night.

Year in and year out, sunspot cycle in and out, 20 is the best all-around band for DX. It is open to somewhere in the world almost 24 hours a day. Because of this, it is probably the most crowded amateur band, and the competition for DX is often fierce. Nonetheless, you can work DX on 20. Your best bet is to work CW and to do so early in the morning (about 5:00 to 8:00 am local time) or late at night, when there aren't so many stateside stations on. At these times, depending on the time of year and the sunspot cycle, the band is often open to several parts of the world and the competition isn't too severe.

The worst time to work 20 is from 4:00 to 7:00 pm, local time. This is when everyone rushes home from work and turns on the rig; the band is very crowded and very chaotic, although it's not as bad on CW as it is on SSB.

You will not do very well on 40 and 80 with low power and low antennas. Because of heavy broadcast QRM, most of the DX work on 40 is done on CW below 7025, so you need an Extra class license. And on 80, most of the DX work on SSB is below 3800 and the CW below 3525, again requiring an Extra. These bands are highly seasonal; in the summer months heavy static makes DXing very difficult, so winter is the time to listen. If you have up good antennas for these bands, you should listen occasionally; DX contacts are possible with low power, especially right at sunrise and at sunset.

Obviously, the time of day you are going to operate depends on many variables: the band you want to use, the time of year, your work schedule, your spouse's sleeping habits, etc. In general, though, your best bet is to pick times when the bands you want to work are open and the competition isn't too tough. Usually, this means late at night and early in the morning.

Another thing to remember about times is that there is the least competition on a band when it is just opening. When 15 opens in the morning, you can often hear many DX stations calling CQ and not getting answers; a couple of hours later, when the crowd has gotten up and discovered that the band is open, the competition becomes fiercer.

Try finding a time period that you can operate every day. That way you will learn the bands that are open at that time, the areas they are open to, the severity of the competition, which band you do best on, etc.

The best operating advice to the low-power DXer can be given in one word: Listen! You are not going to get many answers to your "CQ DX"s; they are usually a waste of time and spectrum. When you first get on a band, tune across it slowly. Write down the calls and frequencies of the DX you hear. You can then learn whether the band is open, and, if so, to what direction.

Keep tuning across the band until you hear a station you need or want to work. If the band is open to an area where you need several countries, don't get involved in a rag chew with a country you don't need (unless rag chewing with DX is your main interest). While you are telling a G3 about the great weather you've been having, an LX1 or a C31 might be calling CQ 5 kHz away.

When you hear one you need calling CQ or finishing a QSO, you should call him on his own frequency, unless he designates otherwise. If no one else is calling him, you need only give his callsign once (he knows what it is) and your own two or three times. It is generally better to give short, frequent calls than to make long ones, unless that's the only way to get through.

Once you have worked your first 50-100 countries, you will find that it becomes increasingly difficult to work new ones without getting into pileups. So, like it or not, you'll need to develop some pileup strategies. Most of the time, you are not going to bust through a pileup with sheer force (you don't have enough). You should try it a couple of times, nonetheless; sometimes selective propagation will put you over the top even with your low power.

There are several tactics that might help you get through faster. One is to wait until the pileup subsides before sending your call. See if you can sneak it into a lull in the pileup. You aren't going to get through if you give your callsign two or three times right after the DX station stands by—everyone else is doing the same thing.

Another tactic is to try calling off frequency a little, even on SSB. If a station is listening off of his own frequency, call him on the fringes of the pileup. If he is listening, say, from 14.025 to 14.030, call him at .030 or .031; you probably aren't going to make it at .027.

Though a dangerous one, tail-ending is another tactic. Here you send your callsign quickly just as the station working the DX signs his call or just afterwards. If the pileup is small and the DX station doesn't seem to mind, tail-ending is OK. Otherwise, don't do it.

Another technique which sometimes works on SSB is to say something besides your callsigns; a station who is saying something else often stands out. You might try things like "W8YA in West Virginia" (works well from rare states), "W8YA for a new one," or "W8YA running low power." Even if the DX station doesn't hear you, some of the big guns in the pileup who hear you might mention to the DX station that there is a low-power station or a "W8 who needs you for

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345

a new one."

Incidentally, use standard phonetics when calling DX. Most DX ops know the standard English phonetics, but they won't understand "Walrus Dionysus Two Long Yellow Underwear." Another tactic, though sometimes questionable, is to ask for help. If you have a friend nearby or you know someone in the pileup who is likely to get through, ask him to pass along your call. This shouldn't be done when the DX is rare, but for common and semi-rare DX it's OK. The best advice in a pileup is to listen and send carefully. Timing will be all important for you because you won't make it on sheer force. Always follow the DX station's requests.

Other than calling stations you tune across and calling in pileups, there are a couple more methods for DXing. One is "piggybacking." Here, the guy across town who runs 5 kW to a 32-element beam at 1000 feet calls CQ DX or calls a specific DX station with you (who have carefully cultivated his friendship) standing by. After he exchanges reports with the DX, he calls you into the QSO and you become part of the roundtable. This is definitely OK unless there is a big pileup or an extremely rare DX station, in which case you will probably get clobbered.

Another method is to check into DX nets. There are several on the bands, mostly on 20 and 15, and once you check in you will be allowed to call whatever DX is on frequency without QRM. One good net to try is the YL International SSB Net at around 14.330. This is a very friendly group of people who are willing to help out low-power stations trying to work their DX check-ins. Because they often have a large number of check-ins, you might have to wait awhile before you get to call.

An increasingly popular and controversial DX method is the list. Here, a strong stateside or foreign "emcee" takes a list of stateside calls and passes them on to the DX station, who then calls the stations one by one. This is fine, as long as the DX station has not had the list forced on him. If you need the country, get on the list if you can. Personally, I have never derived much satisfaction from working DX via a list, but if it's the only way to work a new one, I will do it.

One final way to work DX with low power is through satellites. This, of course, requires some VHF gear and some specialized antennas. The best time to try for DX on the satellites is just at acquisition time as they come over the horizon. In the near future, constant orbit satellites will be sent up and will make it possible to work DX consistently for many hours a day with a few Watts and a small VHF antenna.

Using the preceding techniques and methods, and a few of your own that you will acquire through experience, it is quite possible to work DX, lots of it, with low power and low antennas. It is, in many ways, more challenging and more rewarding than it is to the high-power, big-antenna boys who become somewhat blasé about DX after awhile. The main things you need to remember are patience, listening, and timing. If you work on those three things, you can work a logbook full of DX. Spend most of your time on CW on 10 and 15, and on 20 when those bands are not open. Good luck! ■

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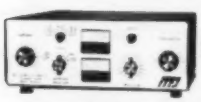

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*Photo C. Detail of the antenna mount and tiedown ring. The antenna is a 48-cm length of brass brazing rod.*

*Photo D. The author enjoying a Saturday afternoon aeronautical mobile (at rest) QSO.*

can get my antenna 2 miles up.

Now let's pop these bubbles in order.

1. "It is against FCC amateur rules to operate aeronautical mobile." Rubbish. FCC rules (part 97) allow the amateur to operate mobile. Period. They do not restrict you to automobile, boat, snowmobile, submarine, or airplane. You may operate aeronautical mobile under exactly the same rules as if you were operating your automobile station in the same area.

2. "It is against FAA rules to operate an amateur station in an airplane." I wish I had a nickel for every time I've heard this ridiculous statement. FAA rule 91.19 *clearly* states that any electronic device that the pilot feels will not interfere with the safe operation of the flight is authorized for use. As a matter of fact, there was so much confusion over this rule that the FAA went out of its way to issue a clarification of the rule to permit not only hand-held rigs but also permanently-mounted amateur sets for the ham pilot. More about this later.

3. "No pilot is going to take me joyriding..." Would you turn down a phone-patch request from one of your neighbors? Wouldn't you give of your time and equipment to someone who wanted to become a ham? Pilots are pretty much the same. Generally, they are quite happy to show off their hobby (or profession) to an interested neighbor. Nor is flying all that expensive. An hour's fuel goes for about $6; if the pilot has to rent the plane, figure on $20 an hour, tops.

One good way of getting to know a pilot is to offer him (or her) a few phone patches to relatives, or invite him over for an afternoon of 20-meter DX work. Gradually lead into the subject of aeronautical mobile, an I'll bet that within the week you'll have your rig in the airplane.

Where do you hang the antenna? Well, if the airplane isn't yours, you're probably going to have to stick to the 2-meter and above bands. I've done my fair share of aeronautical mobile, and I can almost guarantee that an indoor whip or rubber duckie will produce poor results, if any. Even near a window, you are still inside an almost completely enclosed, metallic "screen room," and "getting out" will be difficult, if not impossible.

This situation dictates an outside antenna of some sort, but hanging a whip out in the breeze will also present a fairly difficult mechanical problem. Yes, mechanical—not electrical. Forget the 3-dB-gain long whips, the longwires, and the arrays. A good old quarter-wave whip is more than adequate for aeronautical work. Now the problem will be getting a quarter-wave wire outside the plane, and this is *not* an easily solved problem.

You see, drilling a mounting hole in an airplane requires a tinker's license from Uncle Sammy, and most airplane owners take a dim view of someone punching unnecessary holes in their birds. Also, that wire will have 120 mph winds buffeting it all the time you are airborne, and the last thing you want to do is drop a metal object onto someone's head below. I mean, that kind of thing could ruin his whole day! And for those of you thinking of using a magnetic mount, forget it. That bird's skin is aluminum and besides, the pilot's compass is more than happy to lock onto the antenna base magnet rather than the North Pole, and there are better ways than this of getting lost.

About the only good place for an antenna on OPA (other people's airplanes) is the trunk-lip mount base attached to the baggage (or cargo) door opening. Remember to put in a rubber shim so that the airplane paint job doesn't get marred. If the airplane doesn't have a cargo door, the passenger door may be used, being careful to damage the weather stripping as little as possible.

Another good idea (on high-wing aircraft) is to remove the bolt that attaches the tiedown ring (non-structural) to the strut, insert a home-made whip mounting plate, and reinsert the bolt. Run the coax from this plate into the cabin via the strut, and lace it in place with nylon lacing tie, plastic tie-wraps, or (as a last resort) heavy duct tape. (Photos A, B, and C show construction and installation details of a tiedown-ring mount on the author's Cessna 172.)

If you own the airplane, things are a little easier. I will pass on to you a trick that lets you hang the antenna on the best spot on the airplane—the belly; yet, if and when you decide to sell the airplane, you can remove the antenna mount with no sign of it ever hav-

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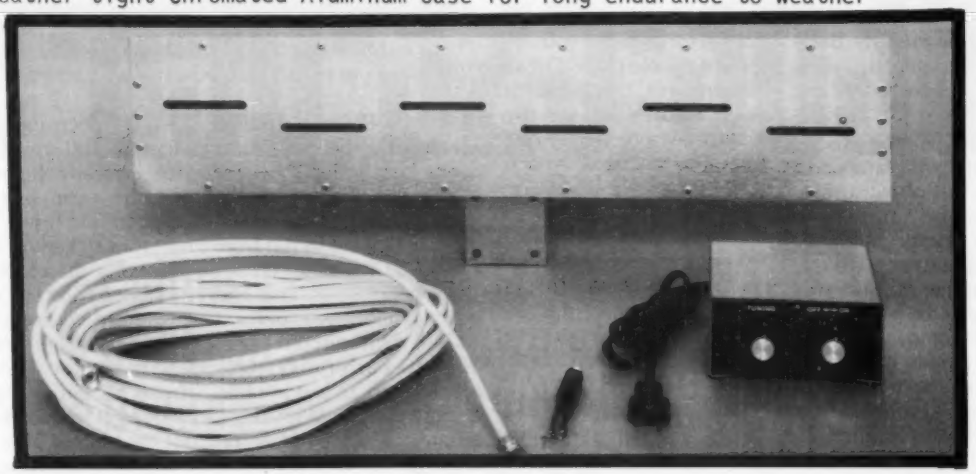

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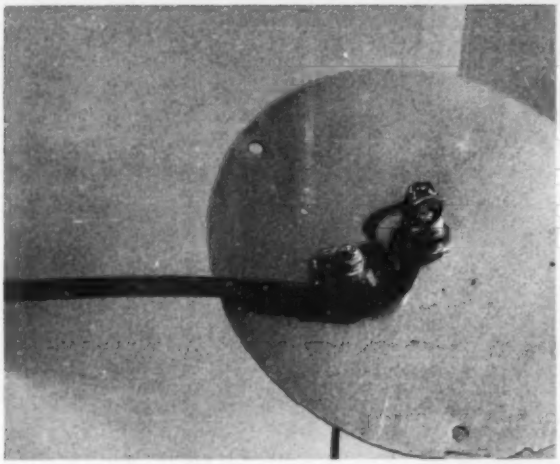

*Photo E. Mounting the BNC connector to a spare belly inspection plate. Note that the cable is securely clamped.*

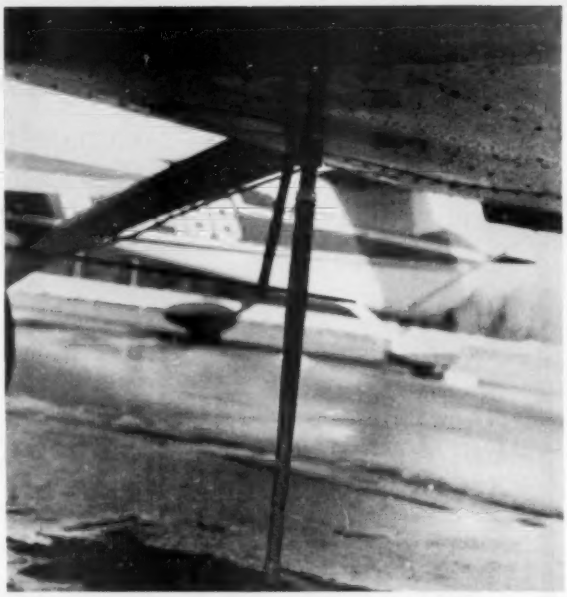

*Photo F. The inspection plate mounted on the belly with a 10-meter band rubber duckie antenna attached.*

ing been on the airplane. Not only that, you will be able to operate any band you wish simply by using plug-in antennas for the various bands.

The trick is this: Go to your friendly airplane parts store and buy an extra "belly inspection-hole cover plate" for your airplane. Drill this extra plate to accommodate a BNC female connector. Mount this connector onto the plate with the female connector portion on the *outside* of the plate. Remove your present belly inspection plate and store it in a safe place, because you will need it if you ever want to take the ham antenna connector off. Connect your coax cable to the inside of the connector, and string the coax up to where the rig is going to be installed. (This last step really should be inspected by a licensed airframe mechanic.) Now bolt on the new plate and connector where you removed the old plate. Cut an antenna for the band of your choice using the quarter-wave formulas from the *Handbook*. Attach it to a BNC male connector, making sure that you fill the connector body with epoxy to keep the antenna rod mechanically attached to the connector. Connect this antenna to the belly plate, fire up the rig, and you are on the air.

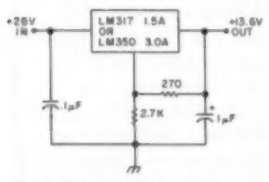
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*Fig. 1. Schematic of 24-to-12-volt converter.*

Before flight, though, have your airframe mechanic make a logbook entry in accordance with Advisory Circular 20-98, "Auxiliary Two-Way Airborne Radio System Installations." In some cases, you may have to get a copy of this AC from your general aviation district office and give it to the mechanic, as most of them have never seen this document. I highly recommend that you tell the mechanic exactly *why* and *how* you plan on installing your antenna—before you start. Hell hath no fury like a ticked-off inspector, and one sure way to torque his jaws is to do your work without telling him, and then ask him to "sign off" your brainchild. (See Photos E, F, and G for a detailed view of this belly-plate antenna installation.)

We now come to the subject of power, because you sure don't want to run from nicads all the time. Well, I have good news and bad news. Ninety-five percent of all light aircraft have 12-volt battery systems identical to an automobile battery supply. With these aircraft, you can plug directly into the cigarette lighter, or have your mechanic put in a separate circuit breaker or fuse (not expensive) just to run your ham rig. If you choose to have the breaker installed, I strongly suggest that you have a molex type of pigtail connector installed in both the airplane and on the rig. Aircraft vibration is a mortal enemy, and "Jones," "octal," and "ribbon" connectors have a nasty tendency to vibrate apart. You might also check your local auto parts store for polarized "bullet" connectors which are also relatively vibration-proof.

Now for the bad news. Since 1978, Cessna and a few others have been using 28-volt electrical sytems, but they still use the *same size* cigarette lighter plug and the *same size* circuit breakers and fuses. There is no more sickening smell in this world than $300 worth of French-fried silicon. The answer, of course, is to ask the pilot beforehand what kind of electrical system he has in his airplane—and if he doesn't know, then he is not the kind of pilot I especially like to fly with! At any rate, if the aircraft you are using has a 28-volt electrical system, I recommend that you use one of the new 3-terminal regulators to drop the 28 volts down to 12. Remember during transmit, your rig will be drawing about 2 or 3 Amps. That means that your regulator will be dissipating up to 50 Watts, as a good heat sink is mandatory. Fig. 1 shows an easy-to-make 12-volt regulator for use with 28-volt aircraft.

Well, I've told you how to get the power in and how to get the power out. The only thing left for me to do is pass along a few tips I've found useful in some hun-

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dreds of hours of aeronautical mobile.

● Flying is hours and hours of fun punctuated by moments of stark terror. If the pilot motions for you to "cool it"—*shut up*. Do *not* make one more transmission to pass along 73s. A curt "QRT—Stand by" is preferable to lousing up approach control's message about the coverging 707. You always can pick up the conversation after the "aluminum overcast" misses you.

● Remember that at altitude, 10 Watts will travel up to 300 miles, and when you hit the button on .34/.94 over Vermont, you will bring up every machine from Maine to New York, including some that may not be too happy about it. Remember that you have fantastic range at this altitude, so work simplex where possible.

● Working 80 through 10 is possible—but not easy. Unless you own the airplane and are willing to make your ADF sense antenna double in brass for a very short whip (matched, of course, with an antenna tuner), then I suggest you do your aeronautical mobile on a band that requries a short antenna.

● Spikes on the 12-volt aircraft supply are not unknown, especially when the flaps, landing gear, landing lights, or other high-current draw items are switched on and off. A 16-volt zener or "transzorb"-style spike suppressor inside the radio will go a long way towards keeping your radio out of the auto-destruct mode.

● DO NOT take this article as license to string wires and cable hither and yon about the airframe without the advice of a pro. The few bucks (or a case of beer) you may have to pay a licensed expert to check your installation is cheap insurance when it comes to betting your fanny.

● And last, but not least, QSL if asked. Some hams go their whole careers without one single /AM on their walls. Above all, have fun. Aeronautical mobile is the least used yet most rewarding mode of operation. I hope to meet you someday in my *first* AM/AM QSO. ■

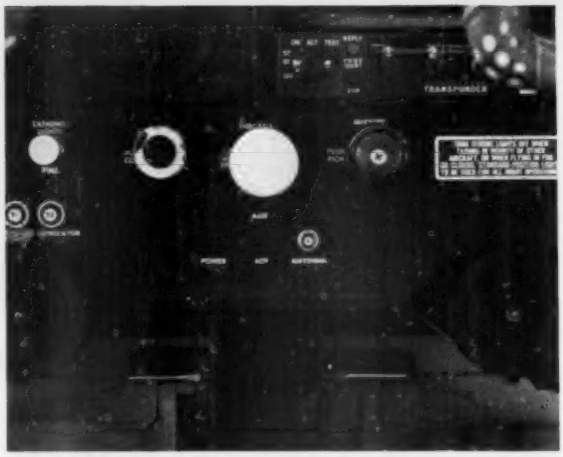

*Photo G. A power and antenna patch panel mounted in a Cessna 172.*


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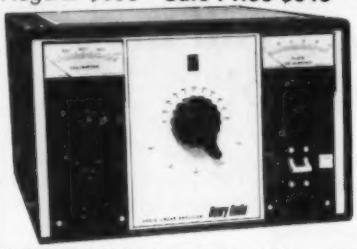

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**MIRAGE B-1016** Similar to B-108, except 5-15w in/160w nominal out @ 10w; 1-2w in gives 30-60w out. Size: 5⅜"w × 3"h × 12"d, Wt. 5 lbs. 13.6 Vdc @ 20-25 Amps.

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# Cybernet Ten-Meter Offset

## — If you've gone CB to 10, why not go all the way? Add the repeater offset, too!

The CB to 10 FM conversion in the January, 1980, *73*[1] has reheated many cold soldering pencils in the past few months. Some of us were lucky enough to find new or working units in the corner of "Ye Olde CB Shoppe" while others either purchased circuit boards from one of the surplus houses[2] or one of the 10 FM transceiver kits available.[3] This growth in activity has led to an increase in the use of both remote bases and repeaters.

What is described here is a simple way to add a repeater offset to any conversion utilizing the Cybernet board (PTBM033, 036, 039AOX) for not much more than the price of the offset crystal required.

The method used incorporates diode switching of the reference crystal oscillator when transmitting. The theory of operation is basic. There are two points on the motherboard that alternate voltages when switching from transmit to receive. When in the receive mode, TP11 produces 7 volts, while TP14 carries 8.5 volts on transmit. By switching these voltages to the proper offset crystal, either simplex or repeater operation can be selected.

The first consideration must be the selection of the proper reference crystal. If the 11.8066-MHz crystal were replaced by one cut for 12.65167 MHz, as discussed in the *73* conversion article, an offset crystal for 12.61833 MHz must be obtained. Some conversions, however, utilized a crystal for 12.57166 MHz, allowing 29.500 through 29.700 to fall between channels 20 through 40. For these, a crystal for 12.53833 MHz is required to provide for the 100-kHz shift.

The entire circuit shown in Fig. 1(a) can be mounted on a piece of Vectorboard® approximately ½" × 1" as illustrated in Fig. 1(b).

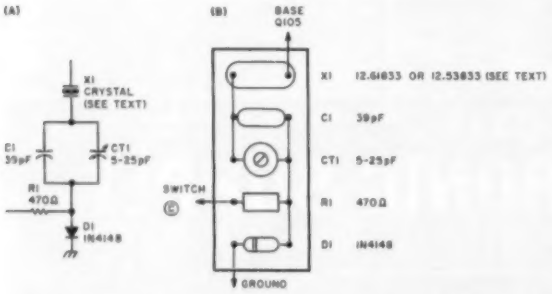


*Fig. 1. (a) Repeater offset switching schematic. (b) Component arrangement.*

**Motherboard Preparation**

Complete the following steps:

1) The circuit board track must be cut to separate where C118 (39 pF) and trimmer CT101 connect to ground, as diagrammed in Fig. 2.

2) To maintain continuity around the severed track, a ground jumper must be added near the edge of the board as indicated.

3) On the foil side of the board, insert a 1N4148 switching diode from the isolated area to the ground track.

4) On the component side of the board, insert a 470-Ohm resistor at the

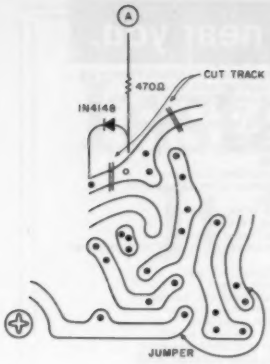


*Fig. 2. A 1N4148 diode mounts on the foil side, while the 470-Ohm resistor mounts on component side next to J103.*

cold end of this diode. This can be done by inserting one end of the resistor in the hole found between jumper J103 and R108 (1500 Ohms). Mount this resistor vertically from the board.

5) Locate TP11 near the 10.695-MHz crystal oscillator, and mount a 1N4148 diode vertically with the cold end down to the board.

6) Locate TP14 (near TP11) and mount another 1N4148 diode in the same manner (cold end down).

7) Connect the hot end of the diode at TP14 to the common position of a SPDT switch (see Fig. 3).

8) Connect the hot end of the diode at TP11 to the open side of the 470-Ohm resistor mounted vertically on the main board and continue this connection to the SPDT switch at the simplex terminal.

**Mounting the Crystal Board**

To mount the crystal board, complete the following steps:

1) Run a short length of wire (1") from the crystal output end of the crystal board to the base of transistor Q105. It is usually best to solder this directly to the lead of the transistor. (Go easy on the heat. They're durable, but don't push it.)

2) For ease of mounting, solder the hot end of the diode on the crystal board to the top of transformer T101. This will not only serve as a good ground connection, but will elevate the crystal board approximately ⅛" above the main board.

3) Connect the open end of the 470-Ohm resistor on the crystal board to the offset terminal of the SPDT switch.

Now, all that remains to be done is to adjust the offset crystal to frequency using your favorite counter and you're ready to work into those machines that you've been hearing.

If you or your club are interested, information on items such as receiver conversion kits and direct replacement 6-kHz NBFM i-f filters are available from me by sending an SASE.

See you on 29.6 FM. ■

**References**

1. "CB to 10 FM," *73 Magazine*, January, 1980, p. 117.
2. Surplus Electronics, 7494 NW 54 Street, Miami FL 33166.
3. Melco 10 FM Transceiver Kits, PO Box 26, Marissa IL 62257.

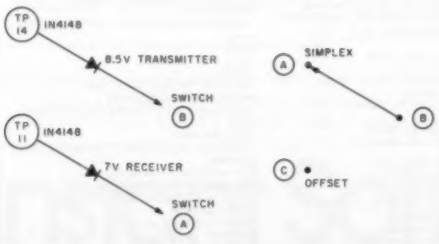


*Fig. 3. Cold ends of diodes are connected to board. Hot ends connect to SPDT switches.*

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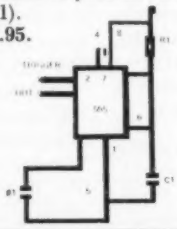

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# A Stout Heart for a Simplex Autopatch

## — put your KIM-1 to work

*Steven G. Erdei WD8CHH*
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*Maple Heights OH 44137*

A simplex autopatch is an automatic phone patch which requires only one frequency for both transmitting and receiving. The simplex autopatch is a time-division type of phone patch; a phone patch whose transmitter is turned off for brief periods of time and whose receiver is turned on, letting the radio user access the phone line. A good discussion of the various types of phone patches has been published in *73 Magazine*.*

The only hardware needed to build this simplex autopatch is a VHF transceiver, three touchtone™ decoders, a phone patch, a touchtone phone line, and a MOS Technology KIM-1 microcomputer.

The KIM-1 computer is the heart of this simplex autopatch since it controls both the transceiver and the phone patch. The VHF transceiver must have a carrier-operated switch connected to the receiver section. This line should be a logic 1 with no signal present and a logic 0 when a signal is being received.

The touchtone decoders that I used are the 567, phase-locked loop type. (This circuitry is not shown since there have been many articles on these decoders in *73 Magazine*.)

The phone patch itself can be any method of coupling audio to and from the phone line. To be able to dial calls directly, the phone line you connect to this system must be able to recognize touchtone digits.

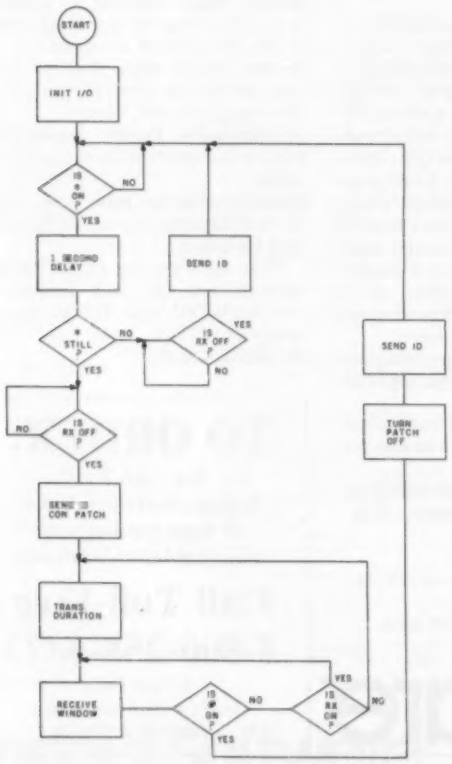


*Fig. 1.*

This program uses less than .5K of memory on the KIM-1. The program's starting location is 0300. When started, the program first initializes the I/O ports. PA0-7 and PB0 are assigned as outputs. PB1-7 are assigned as inputs. Next, the program waits until it receives an access command. This command consists of a received signal and the * digit being decoded. After the initial access command has been decoded, the program will wait for about 1 second and check for the access command again. If the access command is not present, as soon as the received signal goes away, a CW ID will be sent.

If the access command is still being decoded, this is interpreted as a request for a phone patch. As soon as the received signal goes away, a CW ID will be sent, the phone patch connected, and a dial tone broadcast. The program then continues on into the transmit delay section. This is where all audio from the phone line is transmitted.

After the transmit delay, the transmitter is turned off and the receiver is turned on. The receiver is then polled for a signal or command. If no signal is received, the transmitter and

*"Phone Patching '76," *73 Magazine*, June, 1976.

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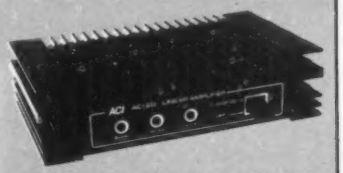

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| 4 | 0C | 5 | 04 | 6 | 84 | 7 | C4 | 8 | E4 |
| 9 | F4 | / | 94 | SPACE | 00 | END OF MESSAGE | | | FF |

*Table 1. ID code table.*

autopatch audio are turned back on and the transmit delay repeated. The receiver on-time (or window) is on for only short periods of time, so the audio from the phone is degraded only slightly.

The transmitter delay time can be changed by altering the value in location 0363. The receive window time can be changed by altering locations 0371 and 0376. If a # digit is decoded (the disconnect command) during the receive window, the patch is immediately disconnected and an ID sent. The ID program is located at 0200 and is called as a subroutine. The ID data table starts at location 0068 and can be programmed using the data in Table 1. A flowchart of the autopatch program is shown in Fig. 1.

Table 2 gives a complete list of all connections to and from the KIM-1. All outputs are a logic 1 when on; all inputs are a logic 0 when on. All input connections should be logic levels and connected to the input pins. The touchtone decoders can be tuned to the proper tones as listed in Table 2, or to other frequencies if you want your system to respond to other digits.

The interfacing of the output lines is left up to the reader because of the differences in the devices that you must control. The best way to interface these control lines is to bring them out to a 7406 hex inverter and have the inverter control relays. You would need to do this for the transmitter keying line, the patch connect line, and the patch

*Program listing for simplex autopatch.*

```
0300  A9 FF     LDA #$FF      SET PA FOR OUTPUT
0302  8D 01 17  STA 1701
0305  A9 01     LDA #$01      SET PB0 FOR OUTPUT
0307  8D 03 17  STA 1703      SET PB1-7 FOR INPUT
030A  AD 02 17  LDA 1702      LOAD AND MASK FOR RECEIVER
030D  29 2A     AND #$2A      ON AND * DECODED
030F  F0 03     BEQ 0314
0311  4C 0A 03  JMP 030A      NO, LOOK AGAIN
0314  A0 00     LDY #$00      PATCH REQUEST DELAY
0316  A2 00     LDX #$00
0318  E8       INX
0319  E0 FF     CPX #$FF
031B  D0 FB     BNE 0318
031D  C8        INY
031E  C0 FF     CPY #$FF
0320  D0 F6     BNE 0318
0322  AD 02 17  LDA 1702      SEE IF * IS STILL BEING
0325  29 2A     AND #$2A      DECODED (PATCH REQUEST)
0327  F0 07     BEQ 0330
0329  A9 FF     LDA #$FF      NO, SET NO REQUEST FLAG
032B  85 D0     STA D0
032D  4C 34 03  JMP 0334      WAIT FOR RECEIVER TO TURN OFF
0330  A9 00     LDA #$00      YES, SET REQUEST FLAG
0332  85 D0     STA D0
0334  AD 02 17  LDA 1702      WAIT FOR RECEIVER TO TURN OFF
0337  29 20     AND #$20
0339  F0 F9     BEQ 0334      RECEIVER STILL ON
033B  20 00 02  JSR 0200      RECEIVER OFF, SEND ID
033E  A5 D0     LDA D0        SEE IF PATCH WAS REQUESTED
0340  C9 00     CMP #$00
0342  F0 03     BEQ 0347
0344  4C 0A 03  JMP 030A      NO, WAIT FOR NEXT ACTIVATION
0347  A9 34     LDA #$34      YES, CONNECT PATCH
0349  8D 00 17  STA 1700
034C  A9 00     LDA #$00      TRANSMIT DURATION TIMER
034E  85 EE     STA EE
0350  A0 00     LDY #$00
0352  A2 00     LDX #$00
0354  E8        INX
0355  E0 FF     CPX #$FF
0357  D0 FB     BNE 0354
0359  C8        INY
035A  C0 FF     CPY #$FF
035C  D0 F6     BNE 0354
035E  E6 EE     INC EE
0360  A5 EE     LDA EE
0362  C9 05     CMP #$05
0364  D0 EE     BNE 0354
0366  A9 20     LDA #$20      RECEIVE WINDOW TIMER
0368  8D 00 17  STA 1700
036B  A0 00     LDY #$00
036D  A2 00     LDX #$00
036F  E8        INX
0370  E0 20     CPX #$20
0372  D0 FB     BNE 036F
0374  C8        INY
0375  C0 05     CPY #$05
0377  D0 F6     BNE 036F
0379  AD 02 17  LDA 1702      RECEIVE WINDOW
037C  29 26     AND #$26      IS # (DISCONNECT) DECODED
037E  D0 0B     BNE 038B
0380  A9 00     LDA #$00      YES, DISCONNECT PATCH
0382  8D 00 17  STA 1700
0385  20 00 02  JSR 0200      SEND ID
0388  4C 0A 03  JMP 030A      GO LOOK FOR NEXT USER
038B  29 20     AND #$20      NO, WAIT FOR RECEIVER OFF
038D  F0 03     BEQ 0392
038F  4C 47 03  JMP 0347      RETURN TO TRANSMIT
0392  4C 79 03  JMP 0379      KEEP RECEIVE WINDOW ON
```

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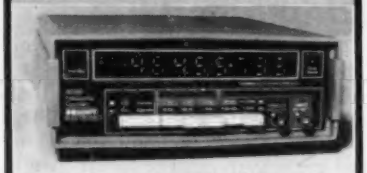

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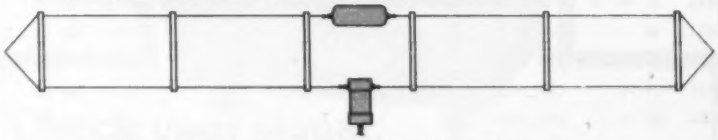

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transmit/receive line, if this line is used. If you want to interface these lines in another manner, remember not to draw more than 1 mA from an output pin.

The simplex autopatch is compatible with normal simplex use on the same frequency. Only transmissions with an access digit are responded to; all other signals are ignored. The following describes how to use the autopatch.

First, to see if you are in range of the autopatch, key your transmitter and momentarily press the * on the touchtone pad. When you release your mike, you should hear the autopatch ID. Second, if you want to use the patch, follow the above procedure, but hold the * down for a couple of seconds. This time, you will hear an ID followed by a dial tone. You can now use the patch just like an autopatch connected to a repeater, with one exception: You must wait about a second before you dial or talk so that your first digit or word isn't missed.

When using the simplex patch, you will notice ticking sounds in the patch audio. This ticking is the receive window that lets you control the patch. When you are finished with your call, send a # and the patch will disconnect and send a final ID.

If you have a problem with the receive window interfering with the quality of the audio from the phone line, the squelch tail on your receiver is probably too long. You can eliminate this problem by removing the electrolytic capacitor following the diodes in your receiver's noise amp. This cured the problem in my system. For what would seem to be a difficult project, the use of the KIM-1 microcomputer turned this autopatch into a relatively easy task. If you have any difficulties in getting your system on the air, feel free to contact me.■

| Inputs | Outputs |
|---|---|
| PB1— 941-Hz decoder output | PA2—Transmitter keying |
| PB2—1477-Hz decoder output | PA4—Patch connect |
| PB3—1209-Hz decoder output | PA5—Patch send/receive switch |
| PB5—Receiver carrier-operated switch | PB0—CW ID audio output |

*Table 2. KIM-1 I/O connections.*

*CW ID subroutine.*

```
0200  A9 04     LDA #$04      TURN TRANSMITTER ON
0202  8D 00 17  STA 1700
020C  BD 8F 02  LDA 028F,X
020F  95 E2     STA 00E2,X
0211  CA        DEX
0212  10 F8     BPL 020C
0214  A2 08     LDX #$08      SEND LEADING SPACE
0216  20 79 02  JSR 0279
0219  A2 03     LDX #$03      SPACE BETWEEN CHARS.
021B  20 79 02  JSR 0279
021E  20 8A 02  JSR 028A      GET CHAR. TO SEND
0221  AA        TAX
0222  E6 E2     INC 00E2
0224  C9 00     CMP #$00      CHECK FOR SPACE
0226  D0 03     BNE 022B
0228  4C 19 02  JMP 0219
022B  C9 FF     CMP #$FF      END OF MESSAGE?
022D  D0 03     BNE 0232
022F  4C 50 02  JMP 0250
0232  8A        TXA
0233  85 DF     STA 00DF
0235  06 DF     ASL 00DF
0237  F0 E0     BEQ 0219      DONE WITH CHAR?
0239  B0 0D     BCS 0248
023B  A2 01     LDX #$01
0242  20 79 02  JSR 0279      SEND SPC.
0245  18        CLC
0246  90 ED     BCC 0235
0248  A2 03     LDX #$03      SEND DASH
024A  20 5B 02  JSR 025B
024D  18        CLC
024E  90 F0     BCC 0246
0250  A2 08     LDX #$08
0252  20 79 02  JSR 0279      SEND TRAILING SPACE
0255  A9 00     LDA #$00
0257  8D 00 17  STA 1700      TURN TRANSMITTER OFF
025A  60        RTS
025B  86 DD     STX 00DD      MARK SUBROUTINE
025D  A5 E6     LDA 00E6
025F  8D 47 17  STA 1747
0262  EA EA EA  NOP'S
0265  EA EA     NOP'S
0267  EE 02 17  STA 1702      PBØ IS CW AUDIO OUTPUT
026A  A6 E7     LDX 00E7
026C  CA        DEX
026D  D0 FD     BNE 026C
026F  2C 47 17  BIT 1747
0272  10 F3     BPL 0267
0274  C6 DD     DEC 00DD
0276  D0 E5     BNE 025D
0278  60        RTS
0279  86 DD     STX 00DD      SPACE SUBROUTINE
027B  A5 E6     LDA 00E6
027D  8D 47 17  STA 1747
0280  2C 47 17  BIT 1747
0283  10 FB     BPL 0280
0285  C6 DD     DEC 00DD
0287  D0 F2     BNE 027B
0289  60        RTS
028A  A6 E2     LDX 00E2
028C  B5 68     LDA 0068,X
028E  60        RTS

Code Initialization

028F  00 05 3B 03 44 D0 C0 C0 C0 C0 C0 00

Sample ID (DE WD8CHH)

0068  90 40 00 70 90 E4 A8 08 08 FF
```

# hey look here

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# MADISON
## Electronics Supply, Inc.
1508 McKinney ↙45
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**lets you adjust your antenna quickly for maximum performance. Measure resonant frequency, radiation resistance and reactance. Exclusive range extender and expanded capacitance range gives you much extended measuring range.**

• **Exclusive range extender** • **Expanded capacitance range** • **Series Bridge**

**$54.95**

**This new MFJ-202 RF Noise Bridge** lets you quickly adjust your single or multiband dipole, inverted Vee, beam, vertical, mobile whip or random system for maximum performance.

**Tells resonant frequency** and whether to shorten or lengthen your antenna for minimum SWR over any portion of a band.

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# pace

CLOSEOUT

**PACE Communicator MX** (left)
Compact, 2m hand-held FM Transceiver. 144-148 Mhz, 1 watt, 6 channels with 18 channel capability (6 simplex, 6 at +600 KHz, 6 at -600 KHz), 1 channel installed (146.52 simplex). Only one crystal per channel. Complete with flexible rubber antenna, nicad battery & charger. Size: 2⅛"w×6⅛"h×1¾"d, Wt. 16 oz ... **CLOSEOUT $129**[95]
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**PACE Communicator I** (right)
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**Accessories for Communicator I:**
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C-1 Desk top AC Charger ..... 39[95]
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25 watt, 800 channel 2m FM Transceiver for 144-147.995 Mhz. Simplex, ± 600 KHz & + 1 MHz offsets. Requires 13.8VDC @ 5 AMPS. Complete with hand microphone, mobile bracket, base stand & power cables. Size: 2.8"h×6.4"w×11.2"d, Wt. 6.6 lbs ..... **CLOSEOUT $249**[95]

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# SAVE $100

ICOM

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**MIDLAND 13-509** 12v, 10w, 12 channel 220 mHz FM transceiver. Crystals for 223.50 mHz simplex installed, mobile mount & microphone included ... **SALE $179**[95]
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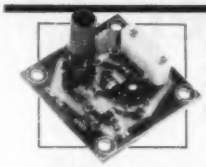

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Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101.
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A single tuned circuit intended for signal conversion in the 3 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 170 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.
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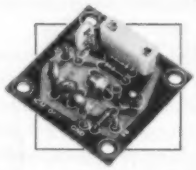

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**PAX-1 TRANSISTOR RF POWER AMP**
A single tuned output amplifier designed to follow the OX oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104.
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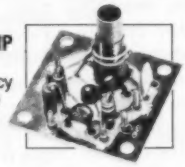

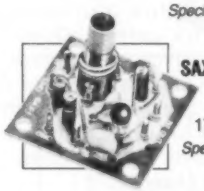

**SAX-1 TRANSISTOR RF AMP**
A small signal amplifier to drive the MXX-1 Mixer, Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 03512. 20 to 170 MHz, Hi Kit, Cat. No. 035103.
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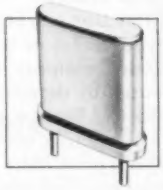

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ICM

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✓36

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Some code readers only copy one or two types of signals, but the **Kantronics Field Day 2** ™ allows you to copy RTTY at 60, 67, 75 and 100 WPM, ASCII at 110 and 300 (if sent as it is typed) Baud and Morse at 3 to 80 WPM.

The **Field Day 2** even has an editing program to improve sloppy Morse. You get more of the message and fewer illegal character signs than with other code readers. With a **Field Day 2** you also get a 24-hour clock, code speed display and TTL compatible demodulator output.

The **Field Day 2** is a complete unit in one package with a large, easy-to-read, 10-character display and is backed with a full-year limited warranty.

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✓See List of Advertisers on page 114

Robert B. Grove WA4PYQ
Grove Enterprises, Inc.
Rt. 1, Box 156
Brasstown NC 28902

# The Bearcat 350 Programmable Scanner

## —a first-class act from Electra

It's hard to believe that only four years have gone by since Electra released their first keyboard-entry programmable scanner, the venerable BC-210. This eminently-usable little scanner was followed in rapid succession by a flurry of new products: the BCs 250, 220, 211, 300, 160—and now, the BC-350.

This new entry from Electra sports one radical innovation: a fully-alphanumeric display. No longer does the listener have to remember that 155.505 is his local police frequency or the 147.045 is the Robbinsville repeater. He can use the keyboard to write in "Police," "Fire," or "RVL RPTR." Up to 8 characters, alpha or numeric, may be entered for display on any channel. Readout is a brilliant fluorescent display.

The alphanumeric function is not in lieu of a frequency entry; either display may be called up alternately by toggling the A/N key.

Another feature which will be well-received is the faster scan/search rate—20 channels per second (10 on slow speed).

*The Bearcat 350 programmable scanner.*

Frequency ranges covered are typical of the new Bearcats: 30-50, 118-136, 144-174, and 421-512 MHz. Electra chooses to break these ranges into seven subbands for advertising purposes. It is significant to note that low-band coverage is now advertised as full 30-50 MHz rather than 32-50 MHz as in previous products. Although the earlier units went down to 30 MHz, performance and parameters were not always repeatable.

The 350 is not tiny; in fact, in spite of the photo, it is the largest unit yet produced by Electra: 12" W × 4" H × 9" D. It was definitely not produced with the mobile listener in mind! However, the BC-350 does have a 12-volt input for those with room.

Sensitivity and selectivity are excellent. 0.4 uV on low and high bands and 0.8 uV on UHF are typical. −60 dB rejection ±25 kHz discriminates against adjacent channel interference.

As with some previous models, 50 channels of memory are allocated to 10 bands, allowing selective call-up of various frequency clusters programmed by the user.

For noisy environments such as those encountered in industrial or mobile installations, a 2-Watt audio amplifier provides plenty of sound from the internal speaker. A rear-apron jack is provided for an external speaker or de-scrambler.

Selective scan delay (an Electra patent) allows for immediate resumption of scan or search after the carrier goes off the air, or it may be toggled to wait 2 seconds for responses on that channel.

A priority feature allows sampling of channel one every two seconds if desired to be sure not to miss a call on that channel. An auxiliary function can be used to activate a remote recorder. A count memory permits the user to determine the number of times a channel has been active, even if you have not been there to hear it. A lockout key allows you to temporarily exclude any channels you wish during scan.

The display is divided into two readouts. The left-hand window provides call-

*Continued on page 101*

# RTTY/CW FOR THE TRS-80*

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Karl T. Thurber, Jr. W8FX
317 Poplar Drive
Millbrook AL 36054

# The Calectro Multi-Tester

## —a full-size, lab-type multimeter for fans of analog operation

The most common items of test equipment needed in the ham shack or home electronics workshop are rf and af signal generators, oscilloscopes, frequency counters, dummy load/wattmeters, grid-dip oscillators, and—perhaps the *primary* instrument—the multi-tester or multimeter.

Little need be said about the utility of the multimeter on the bench or in the home workshop. This versatile instrument allows one to make basic current, voltage, and resistance readings (as a minimum), and for this reason it is indispensable for even the non-technical amateur or SWL—if for no other purpose than to be able to detect open and short circuits or to check one's ac line voltage. For the home-brewer, experimenter, and kit-builder, the multimeter is invaluable in circuit design and development as well as in troubleshooting applications.

*The Calectro 20-205 multimeter.*

The basic multimeter, or VOM, is an analog device that has four, five, or more scales, each representing a different type of measurement, such as ac, dc, Ohms, decibels (dBs), and possibly other parameters. The input arrangement and number of ranges depends on the degree of sophistication and cost of the unit. A primary "driver" of quality and cost (they go together, of course!) is the meter's internal resistance—the higher the better, since units with relatively high internal circuit resistance (20,000 Ohms-per-volt or greater) will tend not to unduly distort readings as a result of loading of the circuit under test by the meter itself.

There is little question that the industry is moving toward the digital-readout multimeter. Frankly, this type of tester can enable a greater degree of *overall* accuracy for the average user, just as the digital watch can permit more precise timekeeping than can the two-hands type. For example, a good digital multimeter's accuracy may be on the order of 0.1 to 0.5% of basic dc scale, whereas good analog meters boast precisions of but 2-5%, not to mention such additional problems as interpolation and parallax errors.

Despite the superior accuracy of the digital instrument, there's still a good deal of room for the analog multimeter for general-purpose electronic usage. The better grade instruments are still a good deal less expensive than equivalent digitals. In addition, for general troubleshooting, the smooth analog meter action is often much preferred over trying to interpret running, flashing digits when working with highly dynamic or unstable circuits. Too, movement trends of the parameter being measured are much more clearly discerned on the analog meter.

There's no shortage of analog multimeters in the marketplace. However, one of the better meters I have encountered is the new Calectro (GC Electronics) model 20-205, formerly known as the H3-361. This high quality, "lab-type" instrument is a multi-purpose multimeter that's a good example of what a better analog model can do. The 100,000 Ohms-per-volt dc internal resistance ensures that most circuits under test will be unaffected by

the meter's presence. I found it to be a very rugged, reliable all-purpose measuring device capable of handling a wide range of ac and dc voltages, resistances, dc currents, and dBs.

The Calectro instrument has a large (4") clear plastic-front meter with a two-color mirrored scale for good visibility and ease of interpolation. The 18-position range switch, when coupled with the four front-panel input jacks, enables selection of 22 ranges. Dc voltage ranges run from 0-500 millivolts to 0-1000 volts. Ac measurements of from 0-2.5 volts to 0-1000 volts are available; VUs are measurable in five ranges from −20 to +62 dB; dc resistance scales run from 0-2000 Ohms to 0-20 megohms; dc current scales run from 0-10 microamperes to 0-10 Amperes. Batteries are required only for the Ohms function (two AA-size 1.5-volt penlight cells will do the trick—use alkaline cells for long life), which incidentally in the R×1 range has a center-scale position of 16 Ohms. This enables convenient and accurate resistance measurements down to a mere fraction of an Ohm.

Meter protection is a particularly important feature of any item of test gear. The Calectro unit is well protected by dual silicon diodes. The protection circuit worked well for me, since through operator error I managed to goof in checking out the unit by making several gross mistakes in range switch selection, including inadvertently placing raw 120-V ac line current across the meter when using one of the low Ohms ranges. No damage was experienced.

The unit's accuracy seemed adequate for most in-shack uses and appeared to be better than the rated dc ±3% and ac ±5% (of full scale) accuracy. The double-jeweled ± 2% meter and temperature-stabilized resistors in the innards undoubtedly contributed to the tester's overall excellent accuracy.

The Calectro device is a large instrument as far as multimeters go, being 7¼" H × 6" W × 2¾" D. It comes with standard color-coded test leads and prods and is list priced at $59.95. There are no accessories advertised for use with it.

While one may easily purchase a much less expensive, miniature multimeter, one will likely find the latter to be but a mere toy beside a higher-quality instrument such as the lab-grade unit I've highlighted here. A good analog instrument can be made to do yeoman duty for a multitude of tasks, including battery testing, transistor or diode checking, and field-strength measuring (when used in conjunction with a diode or rf probe). It can even be used as an S-meter for an older receiver. An rf probe, or a set of extra-long coiled test cables with easy-grip clips, would also represent money well spent.

Sure, I know that the future is digital, but analog has its rightful place, and that place just may lie in your workshop. It certainly does in mine!

The 20-205 is sold primarily through general electronic supply houses. This Japanese-made import is distributed by GC Electronics, 400 South Wyman St., Rockford IL 61101. Reader Service number 479. ■


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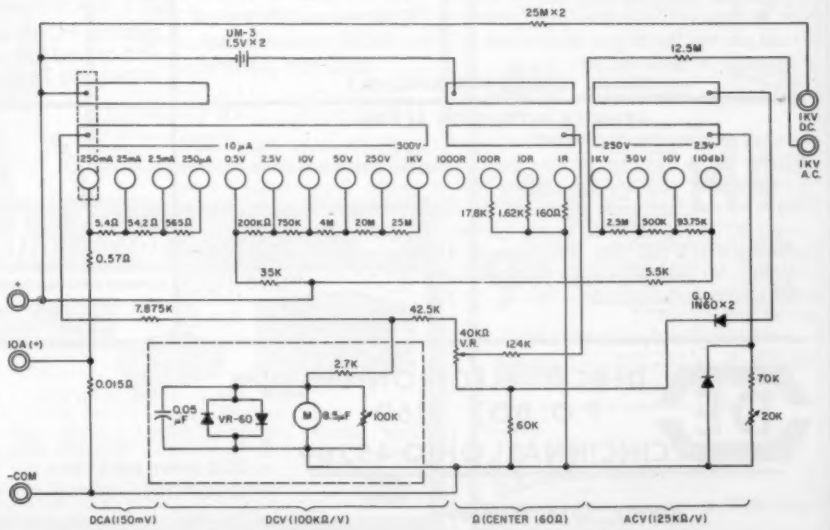


*Fig. 1. Schematic for the Calectro multimeter.*

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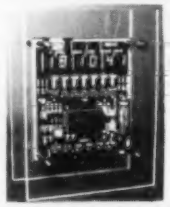

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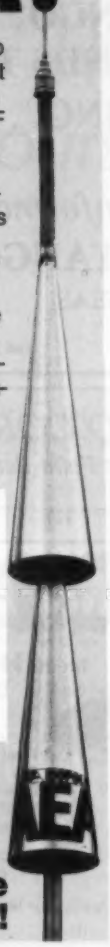

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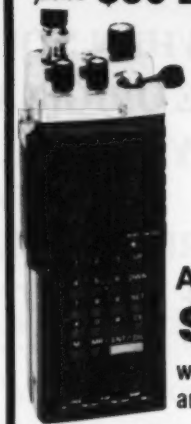

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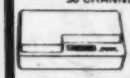

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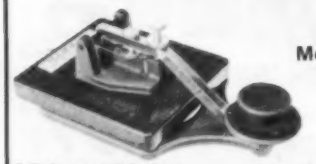

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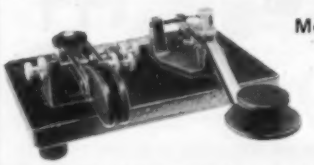

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How To Defend Yourself Against Radar *by Bruce Bogner and James Bodnar. The Brehn Corporation, 1980.*

When it comes to police radar, it seems like the public can't win. In one camp there are the police, backed by the radar manufacturers. On the other side you'll find the people that sell radar detectors and the high-speed buffs that buy them. The information that these two groups provide usually consists of a few facts mixed with a liberal dose of misinformation. The result is a very confused public. The myths, exaggerated claims, and outright lies that are associated with radar are laid to rest in a book called *How To Defend Yourself Against Radar.*

Published by the Brehn Corporation, *How To Defend Yourself Against Radar* is authored by Bruce Bogner, an engineer, and James Bodnar, an attorney. Their combined efforts result in a book that allows you to understand radar without having an engineering degree. Nor will you always need a lawyer to successfully defend yourself against a radar charge.

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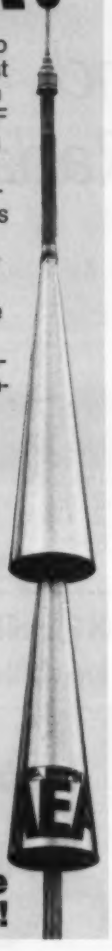

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# Guide to RTTY Frequencies

*Guide to RTTY Frequencies, by Oliver P. Ferrell. 1st Edition, 1980. 96 pages, 6" × 9", paperback, $8.95. Gilfer Associates (PO Box 239, 52 Park Avenue, Park Ridge NJ 07656).*

If you are a ham or SWL, you're probably familiar with the well-known book, *Confidential Frequency List*. The *CFL*, by Oliver P. Ferrell, lists a plethora of "utility" stations (nearly everything except hams and broadcast) from 4001 to 25,590 kHz. It covers AM, SSB, ISB, CW, and facsimile modes of transmission.

Mr. Ferrell has compiled a new book, dedicated to radio-teletypewriter (RTTY) stations. The *Guide to RTTY Frequencies* is similar to the *CFL*, but is exclusively about RTTY. Stations are listed in ascending order of frequency from 4003 to 26,860 kHz. Listed, in most cases, are the frequency, callsign, location, type of service, shift, speed, power, and useful remarks (such as language).

Many of the book's entries are positively tantalizing. Nearly every country is represented with news services, military, aeronautical, marine, or point-to-point stations. This could be a fun way to practice your foreign-language skills! It's also a good way to see "what's goin' on" in distant lands. For that matter, it is interesting to see just what's going on in our *own* land—with USCG, USN, FBI, FCC, MARS, and UPI.

As fascinating (and as useful) as the station listings is the book's "Introduction to RTTY Identification" by Webb Linzmayer. Explained, in detail, are the various types of RTTY signals encountered in the high-frequency spectrum. If you've ever used a "multi-speed any-shift" RTTY receiving setup, you've probably wondered about the RTTY signals that you *couldn't* copy. Mr. Linzmayer explains it all. He describes the various teleprinter codes and multiplex systems in use. Mentioned, too, are various privacy measures designed to frustrate the unauthorized receiver (or printer)! While truly encrypted transmissions probably will not be decoded on the basis of this book's information, it's probable that computer buffs will be able to crack the bit-inversion and bit-transposition privacy schemes. Of course, if you are an amateur cryptographer, RTTY will supply you with endless encrypted material. If you should happen to find a way to decode any U.S. military encrypted material, you might call an intelligence officer and mention the fact!

The *Guide to RTTY Frequencies* should be a valuable addition to any RTTY shack or computerized shortwave station.

Hey, look... there's Interpol talking about my brother again! ■

See List of Advertisers on page 114

Eric Shalkhauser W9CI
527 Spring Creek Road
Washington IL 61517

# The History of Ham Radio

## —part XVII

Reprinted from *QCC News*, a publication of the Chicago Area Chapter of the QCWA.

## EARLY ACTION ON DILL RADIO BILL EXPECTED

**Measure Would Create Independent Commission to Operate Broadcasting**

WASHINGTON, April 29.(AP)—The Dill radio bill, which set up an independent commission with complete power over broadcasting, was approved today by the senate interstate commerce commission with indications pointing to an early favorable report to the senate.

Taken in the face of repeated warnings from President Coolidge against establishment of any more separate government agencies, the action had the effect of sidetracking the White bill, backed by the administration, providing for an advisory committee to work with the commerce department in controlling the industry. This bill has passed the house.

Meanwhile Secretary Hoover, whose department recently lost in the federal courts the right to assign wave length to radio stations, took exception to statements recently made in congress to the effect that he was attempting to become "dictator" of the radio world.

"It's the last responsibility I want," he asserted.

He reiterated his opposition to any plan leaving to any one official the responsibility of determining who shall broadcast and on what wave lengths, because of the expense and bureaucracy tendencies involved.

These duties, he said, should be placed in a semijudicial board of commission as provided in the White bill, and the administrative or enforcement end left to an existing government department.

*A news story published on April 29, 1926.*

From 1912, as wireless was just emerging from its cocoon and Congress first enacted a radio law, until 1927, developments in radio were nurtured by the Department of Commerce under the guidance of then-Secretary Herbert Hoover. Radio was destined to go through many convulsions during those fifteen years . . . the task of prescribing wavelengths . . . issuing licenses . . . specifying power and time on the air . . . legislating. For some 700 applicants, the privilege to broadcast proved chaotic. With the passage of the compromised White-Dill radio bill signed by President Calvin Coolidge on February 23, 1927, the first meaningful legislation on radio control in the United States was accomplished.

### Industry Problems

Toward the end of 1926, because of the mounting problems which constantly arose in the broadcast field, the President was compelled to sign into law an emergency measure. Congressional Joint Resolution 125 became effective December 16, 1926. The law required that any applicant for a new or renewal radio broadcast license "waive any right of claim of right as against the United States to any wavelength, or to the use of the ether in radio transmission because of previous license to use the same or because of the use thereof."

*The Radio Commission, after a visit with President Coolidge. Left to right, H. A. Bellows of Minnesota, J. F. Dillon of California, E. O. Sykes of Mississippi, and O. H. Caldwell of New York.*

### The New Law

Sections 2 and 3 of "An Act For the regulation of radio communications, and for other purposes" specified that:

1) The United States be divided into five zones;
2) A Commission be created consisting of five commissioners appointed by the President, each commissioner a resident of the zone represented; and
3) The members of the Commission have terms of two, three, four, five, and six years, respectively, and shall meet from time to time as required by public convenience, interest, and necessity.

Section 4 authorized the Commission to:

1) Classify radio stations;
2) Prescribe the nature of the services to be rendered;
3) Assign bands of frequencies for each individual station;

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✓See List of Advertisers on page 114

4) Determine the power and the time on the air;

5) Determine the location, and regulate the kind of apparatus used to prevent excessive interference;

6) Have authority to establish areas to be served and make special regulations applicable to radio stations engaged in chain broadcasting; and

7) Have authority to make general rules and regulations requiring stations to keep such records of progress, transmission of energy, communications, or signals as it may deem desirable. (Radio amateurs to keep a log.)

### Commissioners Initiate Course of Action

As early as March, 1927, the following steps were taken by the Commission in General Order #1: Broadcast stations were given authorized channels with even 10-kilocycles separation, original assigned frequencies to Canadian stations were cleared of interfering United States stations, and all amateur and ship station licenses were extended indefinitely as of March 15th.

Time-sharing for all broadcast stations was a major problem. Stations which had deliberately jammed power and had deviated from previously assigned wavelengths came under greatest criticism and penalty.

The Commission immediately set about to reallocate stations in the interest of the listener. By June, 1927, local stations within a given locality were assigned frequencies 50 kilocycles apart. Other stations, especially the higher powered ones, were given assigned frequencies depending on location, public service, and previous time on the air so as to minimize heterodyne interference. In many instances, actual experience and cooperation between stations served as a guide.

The law as enacted applied to all radio stations—ship, land, experimental, amateur, coastal, etc.—with the exception of those operated by the United States Government. Even with the ether lanes crowded, there were over 250 applicants for broadcast-transmitting-station licenses pending at the State Department prior to the effective date of the 1927 Act.

Section 5 of the Act specified that from and after one year after the first meeting of the Commissioners, "all powers and authority vested in the Commission, except as to revocation of license, shall be vested in and exercised by the Secretary of Commerce. The Secretary is to designate call letters of all stations."

Section 9 provided for granting licenses by the Secretary and renewals for three-year periods for broadcast stations, and up to five-year periods for other classes of stations.

### Radio Amateur Rulings

The secretary of Commerce extended amateur operators' licenses by issuing the following order on March 16, 1927: "All radio operator licenses valid at the passage of the Radio Act of 1927 are hereby extended for the unexpired period of such licenses."

As these new regulations were issued, the amateur first-grade license was changed to "radio operator Extra Class," and the amateur second grade changed to "Temporary Amateur License." The amateur Extra First, Experimental, and Instruction Grades were eliminated.

On March 26, 1927, the Commission ordered all supervisors in the various regions to issue temporary amateur station licenses pending the review and issuance of new amateur regulations.

To obtain an amateur operator's license, the applicant was requried to pass a code test in sending and receiving Continental Morse code at a speed of at least ten words per minute. Also required was successful completion of a written examination in the theory, construction, and operation of radio equipment.

At the time of renewal, the applicant was required to report satisfactory activity during the last six months of the license term in lieu of taking another examination.

With the passage of the Radio Act of 1927, all concerned with radio prepared for the forthcoming convention of all nations to the International Radio Telegraphic Conference scheduled to take place in Washington, DC, in October, 1927. ■

THE NEW RADIO LAW as of FEBRUARY 23,1927

[PUBLIC—No. 632 69TH CONGRESS]
[H. R. 9971]

An Act For the regulation of radio communications, and for other purposes.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled*, That this Act is intended to regulate all forms of interstate and foreign radio transmissions and communications within the United States, its Territories and possessions; to maintain the control of the United States over all the channels of interstate and foreign radio transmission; and to provide for the use of such channels, but not the ownership thereof, by individuals, firms, or corporations, for limited periods of time, under licenses granted by Federal authority, and no such license shall be construed to create any right, beyond the terms, conditions, and periods of the license. That no person, firm, company, or corporation shall use or operate any apparatus for the transmission of energy or communications or signals by radio (a) from one place in any Territory or possession of the United States or in the District of Columbia to another place in the same Territory, possession, or District; or (b) from any State, Territory, or possession of the United States, or from the District of Columbia to any other State, Territory, or possession of the United States; or (c) from any place in any State, Territory, or possession of the United States, or in the District of Columbia, to any place in any foreign country or to any vessel; or (d) within any State when the effects of such use extend beyond the borders of said State, or when interference is caused by such use or operation with the transmission of such energy, communications, or signals from within said State to any place beyond its borders, or from any place beyond its borders to any place within said State, or with the transmission or reception of such energy, communications, or signals from and/or to places beyond the borders of said State; or (e) upon any vessel of the United States; or (f) upon any aircraft or other mobile stations within the United States, except under and in accordance with this Act and with a license in that behalf granted under the provisions of this Act.

SEC. 2. For the purposes of this Act, the United States is divided into five zones, as follows: The first zone shall embrace the St[illegible] Maine, New Hampshire, Vermont, Massachusetts [illegible] Rhode Island, New York, New Jersey, Del[illegible] District of Columbia, Porto Rico, and [illegible] zone shall embrace the State[illegible] or any right Virginia, Ohio, Michi[illegible] ...mmenced in any civil [illegible] ...abilities under said laws shall embrace the S[illegible] ...ed in the same manner as if committed; Florid[illegible] ...forfeitures, or liabilities incurred prior to taking ...ect, under any law embraced in, changed, modified, or re-...ated by this Act, may be prosecuted and punished in the same manner and with the same effect as if this Act had not been passed.

Nothing in this section shall be construed as authorizing any person now using or operating any apparatus for the transmission of radio energy or radio communications or signals to continue such use except under and in accordance with this Act and with a license granted in accordance with the authority hereinbefore conferred.

SEC. 40. This Act shall take effect and be in force upon its passage and approval, except that for and during a period of sixty days after such approval no holder of a license or an extension thereof issued by the Secretary of Commerce under said Act of August 13, 1912, shall be subject to the penalties provided herein for operating a station without the license herein required.

SEC. 41. This Act may be referred to and cited as the Radio Act of 1927.

Approved, February 23, 1927.

*The new radio law as of February 23, 1927.*

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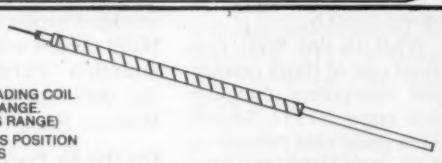

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✓See List of Advertisers on page 114

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# The Robot 800H

## —a specialty terminal for RTTY/Morse/SSTV and you

The clanking of the Model 15 shatters yet another quiet evening with its growl and clatter. Autostart at 2 am certainly makes its shortcomings known quickly.

What to do? Well, how about one of those newfangled computers that can also copy RTTY? Sounds like a good idea to me—so it's over to the back issues of the ham magazines to see what is available. I discovered that there are new models coming out almost every day! Decisions, decisions, decisions. Hmmm, Robot offers a new model, the 800H. It sends and receives Baudot, ASCII, and Morse, and it also has an SSTV character generator. Sounds interesting, indeed, so I call the local Robot dealer to order the Robot Model 800 Super Terminal.

### It Arrives

The seemingly endless hours of waiting for the new rig finally came to an end. The UPS man delivers the Robot in perfect condition. I excitedly unwrap it and begin hooking it up in the shack. Included with the terminal are: 1 Model 800 keyboard, 1 six-foot shielded cable with RCA phono plugs on each end, 1 six-foot coax cable with BNC plugs on each end, 2 six-foot three-conductor shielded cables with phone plugs on one end, and 1 instruction manual. Robot has really made it easy to hook up the Model 800!

### On-The-Air Performance

The Robot Model 800H is designed to receive and transmit Baudot, ASCII, and Morse code. It will also send SSTV block letters, but will not receive SSTV without using a separate converter.

The Robot Model 800H works wonderfully on RTTY. A status indicator line is provided at the top of the display which gives information about how the terminal is configured, such as receive or transmit, speed, polarity, autostart, Selcal, selcom, and a tuning indicator.

A signal is tuned in by adjusting the vfo until the tuning indicator is at its longest position and is flickering the least. This corresponds to the maximum signal through the filters and to both tones (mark and space) being passed equally well. There are connectors on the rear panel for connecting an oscilloscope if you wish to use one to tune in your signals. The terminal can be configured to receive in one of three modes: normal, autostart, or selcom.

Normal-mode receive allows any signal which makes it through the filters to be printed on the screen. This mode works very well on signals that vary in strength. Were one of the other modes to be used, such as autostart, characters would be lost when the signal dropped out and the autostart delay had not yet allowed the resumption of displaying the received RTTY information.

Autostart mode prevents the display of unwanted characters on the screen without a RTTY carrier being present. There is a built-in 3-second delay before characters will be displayed during which a valid carrier must be present.

Selcom mode is a dual-function mode. It supports WRU ("Who are you") automatic answer-back and automatic message recording (Selcal, or selective calling). The WRU code is user programmable by merely typing in the desired 8-character code, as in the Selcal code. The status line on the display will show the codes as you type them and will allow corrections to be made without any fuss. Merely hit the delete key and the last character entered vanishes from the screen.

There are three transmit modes which are selectable by the user. They are continuous, line, and word modes. Continuous mode is similar to RTTY operation using a teletype™ machine. Your carrier is keyed on and remains on while you hunt and peck for the proper keys. Line mode does not transmit anything until the Model 800 detects a carriage return. It then sends the entire line while still allowing you to type in the next line of text. Word mode sends each word as it is completed and the Model 800 detects a space. This allows the correction of spelling errors before sending the word.

Speeds may be changed between any of six available speeds. They are: 60, 66, 75, 100, and 132 wpm (Baudot) and 110 baud ASCII. Speeds may be changed by merely typing one command. The terminal toggles between the various speeds available in the terminal.

There are three shifts that the Model 800 can copy. The terminal can be toggled between 170 Hz and 850 Hz. By straddle-tuning the signal, 425 Hz can be copied. Each time the CTL-Shift key is depressed, the terminal changes shifts. Should you run into a situation where the received signal is reverse polarity, the polarity may be inverted by pressing CTL-Reverse. Typing CTL-Reverse again will toggle the Model 800 back and forth from normal to inverted modes.

There are RY and Quick Brown Fox test messages available by pressing a key. An automatic CW ID is provided for use in RTTY mode. You can fill up the buffer (up to 511 characters) with any combination of messages and IDs and they will be sent automatically when you switch the Model 800 into transmit mode.

The Model 800 word-wrap feature makes reading the received copy much easier. If a received word will not fit entirely on the present line being typed, the program will erase the unfinished word and move it in its entirety to the next line down. In this way words retain their meaning much better by not being written on two separate lines.

**RTTY Performance**

The Robot Model 800H is outstanding when used on RTTY. Signals can be tuned in easily by using the status line tuning indicator. The built-in demodulator easily equals the performance of many stand-alone terminal units.

One possible problem exists, though. When ordering the Model 800, be sure to specify that high tones are to be installed in your unit if you want to work 2m RTTY. The standard unit is supplied only with low tones which will work fine on HF but will not be compatible with VHF mark and space tones. My unit was supplied with the low tones, and a trip back to the factory was required to modify it to work on VHF.

**Morse Code Operation**

The Robot Model 800 also has provisions for Morse Code reception. A very narrow audio filter is built in which helps select the particular signal of interest. The narrow filter also makes it extremely difficult to tune in the signal.

When receiving Morse code, the signal is tuned until the terminal regenerates the code on its internal speaker. The tuning indicator in the status line helps in tuning by indicating the signal level passing through the filter. Merely tune for maximum indication.

Problems arise if you expect the terminal to provide perfect copy under field (read "real life") conditions. It won't. The terminal hopes to see perfect machine-sent code. How could you expect otherwise? It is a machine, too. Its program has some provision for sloppy fists, but when combined with the touchy audio level adjustments and the critical tuning adjustments required for copy, the program tends to let you down.

When the terminal does not understand the character sent, it types an asterisk. International Morse code A-Z, 0-9, .,?:;-/, AR, AS, BT, KN, and SK are all recognized and printed by the terminal.

The terminal will also send Morse from 3 to 99 words per minute. The 511-character buffer is functional when sending code as well as RTTY. Here, too, the buffer allows you to type and edit your message while the buffer is being sent.

The terminal can also be used as a Morse code trainer. It will generate random characters which can be copied by utilizing the split screen. Received practice copy is printed on the bottom half of the screen, and sent copy is typed on the upper half of the screen. Your accuracy can then be checked by comparing the two versions.

**SSTV**

The Robot Model 800 also supports SSTV. It will send up to a 6 × 6 character message using block letters. This can be a help to contest operators who normally use a menu board to pass QSL information. By merely typing the desired information on the terminal, it will be sent via SSTV.

The terminal also will send a gray scale, checkerboard, reversed black/white characters, large characters, and partial frames. Cursor control is available to help with formatting your message. Home up, line feed, delete, repeat, and return functions are supported in SSTV mode. This allows a greater flexibility in formatting your messages.

**Documentation**

The Robot Model 800 is supplied with a very attractive three-ring binder to hold the system information and instructions. I consider this to be a plus. Being able to put my finger on the system information quickly helps to learn the commands faster and helps me to find my errors in operating the system faster. The only problem is that my unit, which is one of the earliest with the high tones/split-screen options installed, does not have a complete set of documentation. I find myself looking at advertisements to see just what my terminal can actually do and then experimenting in order to discover the commands required to perform the various "new" functions. What with the rush to get the product into the marketplace, an omission here and there is expected. By the time you read this, Robot will have everything working fine and will be able to supply all the information you might require.

**Conclusion**

The Robot Model 800H is a very useful piece of equipment to have in your shack. It will provide RTTY, Morse, and SSTV capabilities to you while being packaged in a small neat enclosure. The keyboard provides a good "feel" to the touch typist, which is a real plus when reading the incoming RTTY message and formatting your reply in the buffer.

The terminal has problems copying Morse code, but you must keep in mind that the filter that is as good as the human ear has not yet been designed. The human ear can discern subtle tone differences which can differentiate between two signals on virtually the same frequency. My four years of electronic warfare experience make my standards for copying Morse very stringent. I know of *no* terminal or program that can equal an experienced operator when copying code. I heartily recommend the Robot Model 800 for the enthusiast who needs a very high quality silent RTTY/Morse/SSTV terminal.

For more information, contact *Robot Research, 7519 Convoy Court, San Diego CA 92111.* Reader Service number 478. ■

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Downers Grove IL 60516

# The Better Vertical

## —elevated feed means low angle of radiation

How would you like to be a proud owner and user of an inexpensive (around $60-$70) vertical DX antenna which—

- Is self-supporting.
- Is attractive in appearance.
- Can be installed in a limited space.
- Gives a low vertical radiation angle even when it is one wavelength long.
- Can be used on all present and future amateur bands.
- Minimizes TVI because its radiation is vertically polarized and because harmonics are radiated at high vertical angles.
- Is safe from shock hazards because its base is grounded.
- Has a built-in lightning protection system.

If you answered in the affirmative, then this antenna is for you. This article describes how to build, install, and tune a 33-foot, elevated-feed vertical antenna.

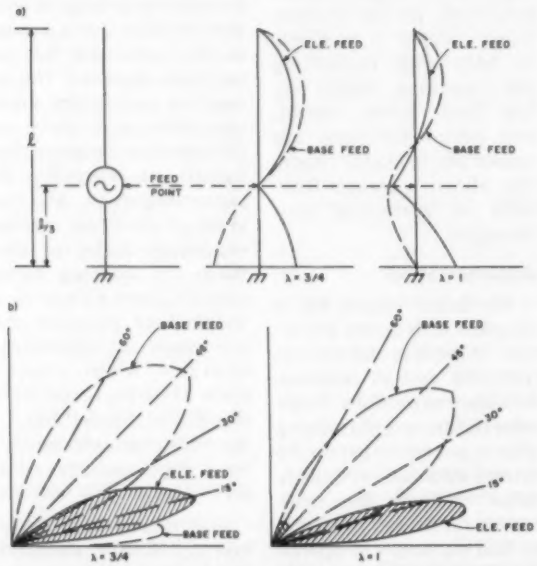


*Fig. 1. (a) Current distribution and (b) vertical radiation patterns for 3/4λ and 1λ elevated-feed vertical antennas.*

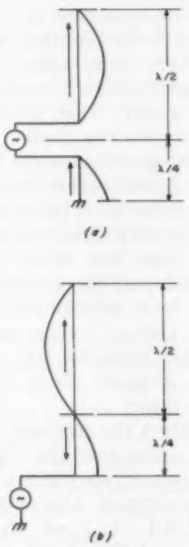


*Fig. 2. Currents along antenna element for 3/4λ, elevated feed (a) and base feed (b).*

### Theory

An elevated-feed vertical antenna is not a vertical antenna which is elevated. It is a vertical antenna which is fed at a point which is 1/3 of its height from the ground—see Fig. 1(a).

I first came across the discussion of this antenna in *Amateur Radio Techniques*.[1] It contains a discussion of how an elevated-feed vertical antenna can be applied to amateur work to obtain "... low-angle radiation, without unwanted high-angle lobes, from vertical aerials of appreciable electrical length."[2] It explains how feeding a vertical antenna at the 1/3 point produces a current distribution different from that of a base-fed antenna. This is true only in cases where the antenna element is 3/4λ or 1λ long. If element length is 1/2λ or less, the elevated feed will perform approximately the same as a base-fed vertical antenna of the same height.

The comparisons of the current distributions and approximate vertical-radiation patterns for the base-

fed and elevated-feed antennas are shown in Fig. 1. To understand how a low vertical radiation angle is achieved in the elevated-feed antenna, one should study the current distribution along an antenna element. *The ARRL Antenna Book* states that current is reversed every 1/2λ along the element.[3] Fig. 2(a) shows how this results in an in-phase collinear array in the elevated-feed antenna which is 3/4λ long. This in-phase current distribution along the antenna element is the reason for its low vertical angle of radiation. If the same antenna were fed at the base, the current distribution would not be in phase —see Fig. 2(b)— and an unwanted high-angle lobe would appear in the vertical plane as shown in Fig. 1(b).

**Design Considerations**

In the design, I gave priority to the following considerations:

(1) Limiting the design to a reasonable height.
(2) Incorporating a top hat to dissipate static charge.
(3) Positioning the tuning unit near the ground.
(4) Designing and building a strong yet inexpensive center insulator from readily available materials.
(5) Designing the antenna strong enough to be self-supporting.

I chose an overall antenna length of 33 feet as this would give me a full wavelength—the longest practical length for DX operation —on 10 meters. The 33-foot length meant that the upper section must be 22 feet because the antenna is fed 1/3 of the length from the ground. This would make it 1/2λ from the feedpoint on 15 meters, so I detuned it slightly to lower the impedance at that point. The optimum length of the upper section, as determined by 15-meter and 20-meter band impedance curves, was found to be 24.5 feet.

Because aluminum tubing comes in 8-foot sections, and because I would lose 2-feet in the bushings and overlap, the available length from three sections was reduced to 22 feet. To get around this limitation, I decided to enlarge the considered top-hat section to achieve the desired effective length. Four top-hat radials, each 1.3 feet long, were experimentally found to provide the missing link.

The prospect of climbing a stepladder to adjust the tuning unit did not appeal to me. To avoid this, I chose to place the tuning unit near the ground and to use a 12.5-foot section of RG-8 foam coaxial cable to carry the power from the tuning unit to the feedpoint. Theoretical approximation showed that, at the worst, an swr of 7:1 would be present. The additional power loss for a 12.5-foot section of RG-8 foam cable with an swr of 7:1 was found to be 0.25 dB. I preferred this to climbing the ladder.

Power limit at an swr of 7:1 is found by dividing the power rating of the cable at an swr of 1:1 by the swr under operating conditions.[4] For this application, this is 2200/7 = 314.3 Watts. The output from a kW linear should be approximately 500-600 Watts. For intermittent duty, the average power would be half of this figure, or some 300 Watts. This does not give much of a safety factor, but I decided to go ahead and worry about it when and if I acquired a linear.

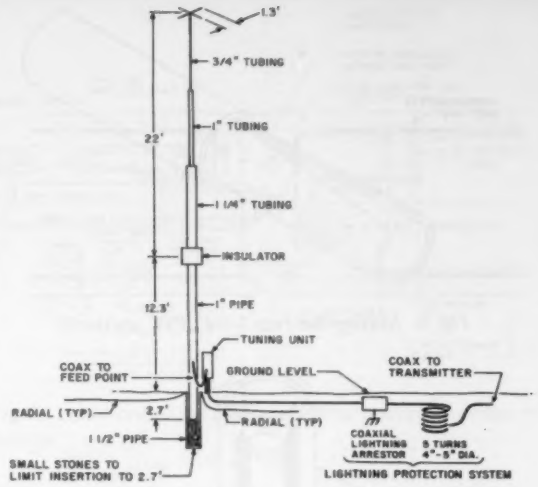


*Fig. 3. Final design of the elevated-feed vertical antenna.*

To make the antenna as attractive as possible, I designed it strong enough to be self-supporting. This presented no great problem except for the center insulator, which proved to be the greatest challenge of the whole project. It must be strong enough to support the upper 2/3 of the antenna without guying. I finally settled on building the insulator from PVC pipe reinforced with plexiglas™ panels and nylon cord, the whole thing held together with silicone rubber bathroom caulk and epoxy. I calculated the insulator's strength to be much greater than that of the aluminum tubing right above it. So, theoretically at least, the antenna should break at the tubing and not at the insulator.

By calculating stress values for the whole antenna, I found that if I used 1" steel pipe for the bottom 1/3 section and 1-1/4", 1", and 3/4" aluminum tubing for the 3-piece upper 2/3 section, the antenna would be strong enough to be self-

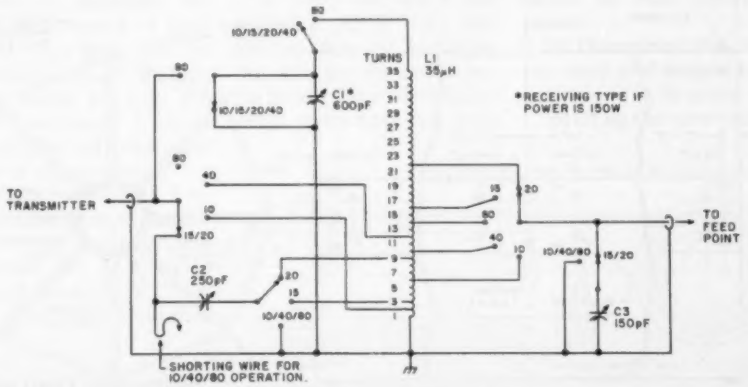


*Fig. 4. Antenna tuning unit set for 20 meters. All air variables not in use are shorted and grounded.*

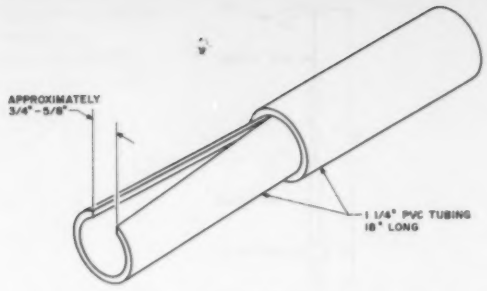


*Fig. 5. Joining the two 1-1/4" PVC sections.*

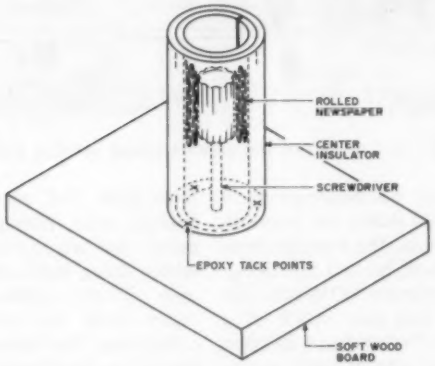


*Fig. 6. Jig for the construction of the center insulator.*

supporting. The weakest link would be the 1-1/4" aluminum tubing section. Moral support for this decision came from Capt. P. H. Lee's excellent book, *The Amateur Radio Vertical Antenna Handbook*, where he used this size tubing to construct his Mark II antenna.[5] He claimed that the antenna was flexible; it bent with a high wind and did not break.

The final design of this antenna is shown in Fig. 3, and the tuning unit is shown in Fig. 4.

**Construction Procedure**

The construction is started by the assembly of the center insulator. Fig. 5 shows how one piece is cut and inserted into the other piece. Use PVC pipe cement to bond the two pieces together.

Fig. 6 shows how an inexpensive jig can be constructed from a screwdriver and a piece of soft wood. This jig will hold the cemented PVC pipe in a vertical position to ease the task of cementing the plexiglas panels. The panels can be epoxied to the pipe first so that they will stay in place when applying the silicone rubber bathroom caulk.

Before cementing the plexiglas panels, insert the steel pipe and aluminum tubing into the PVC pipe to the dimensions shown in Fig. 8, i.e., to within 1/2" from each other, centered at the center of the insulator. Mark the radial direction on the pipe, aluminum tubing, and insulator. Drill holes 90° apart in the pipe and tubing for the mounting bolts, drilling through the PVC pipe. When drilling in pipe, *use a 1/4-20 tap drill* and enlarge the hole to 1/4" when the pipe is removed. The position of all holes is shown in Fig. 7. To avoid weakening the pipe, stagger the tap holes. This procedure will align all the holes and assist in the final assembly.

When the bathroom caulk has cured, wind five bands around the panels as shown in Fig. 7. Use nylon or dacron line approximately 1/8" in diameter and space the bands evenly. Epoxy the line for extra strength and to prevent it from unwinding. Drill the two vent holes between the panels in the center of the insulator. Build a little roof over the vent by using caulk. This will prevent moisture from seeping into the insulator.

The three sections of the aluminum tubing are assembled as shown in Fig 9. The bushing is made by cutting 6" from the smaller of the two pieces at the junction, splitting it and forcing it over the shortened piece.

The top hat is made by cutting a 3-foot length from aluminum clothesline, bending it in the center, and bolting it in place as shown in Fig. 10. After it is bolted in place, bend it until it is perpendicular to the tubing. After bending, cut it to the dimension shown (1'4") and spread the two wires until they are 90° apart. Install the top button and seal the whole area with bathroom caulk.

If possible, obtain a piece of 1" Schedule 40 pipe which is 15 feet long. If this cannot be obtained, use one 10-foot and one 5-foot section. Position the 5-foot section next to the insulator and join the two pieces together by using a 12-inch piece of 1-1/4" Schedule 40 pipe and 1/4-20 bolts. Use aluminum sheet between the pipes for a tight fit. Drill and tap the holes at this junction by following the same procedure as outlined previously when drilling holes in the center insulator. Drill one 7/16" hole approximately 4-5 feet from the bottom end of the pipe. This is the exit hole for the coaxial cable.

Cut a piece of RG-8 foam

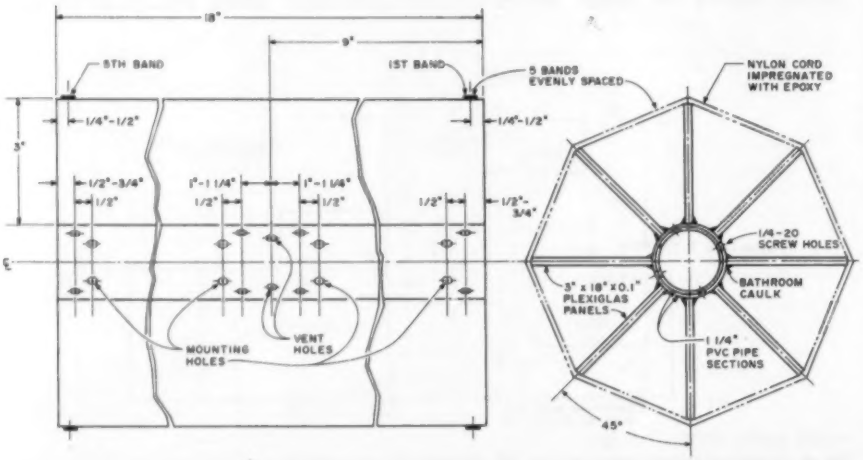


*Fig. 7. Construction of the center insulator.*

coaxial cable 15 feet long. Strip one end as shown in Fig. 8. Allow sufficient length of shield to produce the slack. During assembly, the pipe and aluminum tubing will come together across the 1/2" gap forcing the coax down. The slack is needed to prevent bending or damaging the center conductor. Impregnate the center conductor and the shield with solder so that about 1/4" of soldered length will protrude from the silicone rubber caulk when applied. Apply silicone rubber caulk as shown in Fig. 8 to seal the cable from moisture.

Thread the cable from the insulator end to the 7/16" exit hole by using a length of wire taped to the cable. Exercise caution in taping the cable since the hole does not allow too much clearance for the RG-8 cable.

Fig. 11 shows the position of the three components prior to assembly. Use electrical tape and aluminum sheet wrapped around the tubing and the pipe as necessary to ensure a tight fit for the center insulator. Cut holes in them for the bolts to pass through and smooth all edges so that the center insulator slides smoothly over the aluminum tubing and the steel pipe.

Slide the center insulator over the aluminum tubing. Verify the markings which were made during the drilling to avoid hole alignment problems.

Attach the shield of the coaxial cable to the pipe first. To do it, drill and tap a 1/4-20 hole in the pipe about 1/2" from the end, as shown in Fig. 8. Screw a 1/4-20 bolt from the outside of the pipe. Secure the shield to the bolt inside the pipe with a nut. Tighten the nut. Cut the bolt flush with the outside of the pipe wall.

Bend one edge of aluminum tubing and drill a 10-32 clearance hole in the bent section, as shown in Fig. 8. Attach the center conductor to the tubing by using 10-32 hardware.

Slide the aluminum tubing until it butts against the pipe. If the slack in the shield is of correct length, the two pieces should butt without any problem. If they do not butt properly, more slack in the shield will be required.

With the two sections butted, slide the whole antenna until it rests against a wall or other stationary object. Slide the center insulator over the pipe until the mounting holes are in alignment. Secure the insulator to the pipe by using 1/4-20 $\times$ 1/2 bolts. Gently slide the aluminum tubing out of the insulator until the mounting holes are in alignment. Secure the insulator to the tubing using 1/4-20 $\times$ 2 bolts and nuts.

Install the antenna in a 1-1/2" pipe, 5 feet long, which is driven into the ground to a depth of 4-1/2 feet. Small stones are dropped into the pipe to limit the depth of insertion. Aluminum or hardware shims are used to hold the antenna in place.

A ground radial system is needed for optimum performance, especially on the 80- and 40-meter bands. I have five radials, each 33 feet long, and I plan to install eight more. As with every vertical antenna installation, a low ground resistance is necessary for good performance. A high ground resistance (few or no radials) results in high power losses because the ground resistance is in series with the radiation resistance of the antenna.

For this installation, I attached the ground radials to the 1-1/2" buried pipe. I grounded the antenna to the pipe by using a 1/2" $\times$ 1/8" aluminum grounding strap.

### Tuning Unit Construction

The schematic of the tuning unit is shown in Fig. 4.

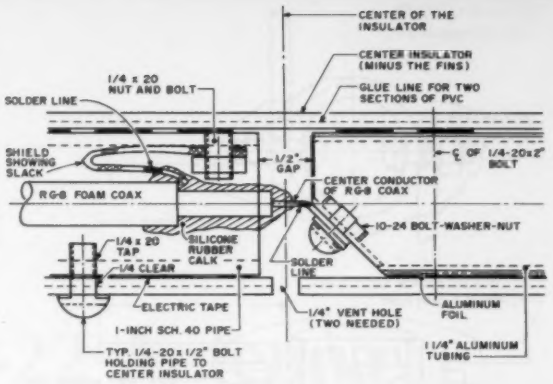


*Fig. 8. Locations of the pipe and tubing within the center insulator.*

The unit is installed next to the antenna, but not grounded to it. It is grounded only to the shield of the coaxial cable.

I constructed my tuning unit on a piece of plexiglas 7-1/2" $\times$ 16-1/2" and mounted it inside a watertight cabinet. Since I had enough air-variable capacitors in my junk box, I decided to be extravagant and use separate C2 and C3 air variables for the 15-meter and 20-meter bands.

One word of encouragement: The construction of this unit is not complicated. The cost to build it need not be high. I obtained all the parts and the cabinet for about six to seven dollars at two hamfests held in my local area. The real bargain find was an old Army surplus tuning unit which was priced at $5.00. This unit yielded two air variables, the coil, and the enclosure. To those of you reading this article who have not been to a hamfest, my advice is to go to one! It is lots of fun plus being a place for some real bargains.

Once the tuning unit is built, connect it to the coax feeding the antenna and to the transceiver placed next to the unit. Follow the procedure below to obtain tap points for your coil.

### Tuning Procedure Using Swr Meter

(1) Connect the swr meter in the line between the transceiver and a dummy load.

(2) Tune the transceiver as usual for maximum output on the 80-meter band. Adjust the swr meter sensitivity for a full-scale forward power indication.

(3) Do not change any of the transceiver or swr meter settings. Switch the swr meter to read reflected power.

(4) Disconnect the dummy load and connect the tuning unit in its place.

(5) Using the turns ratio in

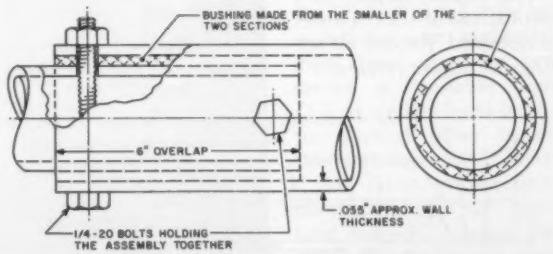
BUSHING MADE FROM THE SMALLER OF THE TWO SECTIONS
6" OVERLAP
.035" APPROX. WALL THICKNESS
1/4-20 BOLTS HOLDING THE ASSEMBLY TOGETHER

*Fig. 9. Assembly of the aluminum tubing sections.*

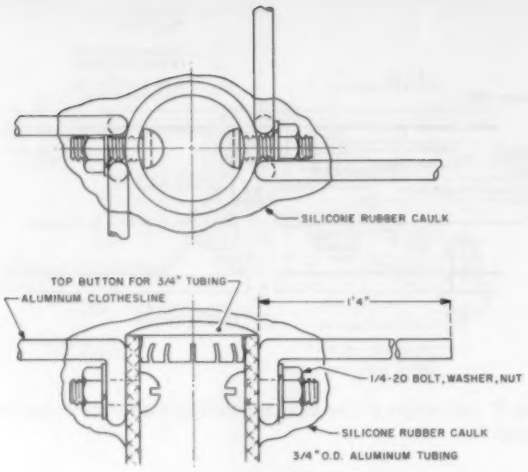


*Fig. 10. Top-hat assembly.*

Fig. 4 as a guide, connect the appropriate wires to the coil using alligator clips or equivalent.

(6) Position all tuning unit switches to 80 meters and adjust all air variables to *minimum* capacitance.

(7) Watching the swr meter, place the transceiver in the transmit mode. The swr meter may show anything from an off-scale reading to an swr of 1:1.

(8) Not changing any of the settings on the transceiver or the swr meter, note the swr reading. Place the transceiver in the standby mode.

(9) If the swr was high, adjust the taps on the coil and repeat steps 7 and 8. If the swr was low (swr meter deflection is 1/2-2/3 scale, equivalent to an swr of about 3:1 to 5:1), leave the taps alone and adjust the air variable for an swr of 1.3:1 or lower.

(10) Repeat steps 7 to 9 until an swr of 1.3:1 or lower is obtained. Record all settings for future reference.

(11) Repeat this procedure for the other bands.

The procedure is designed to obtain the best possible match by adjusting the turns on the coil first. Once this is accomplished, air variables are used to reduce the swr still further. Always adjust one component at a time and fight the temptation to tinker with knobs. It took me two days to learn this lesson.

### Connecting the Antenna To the Shack

After installation and tuning, connect the antenna to the shack by using buried RG-8 coaxial cable. Install the lightning protection system as shown in Fig. 3. It consists of a coaxial lightning arrestor grounded to a 5'-6' ground rod, followed by the turns in the coax. Tape the arrestor well with electrical tape to prevent moisture damage.

### Performance

The theoretical performance calculations were hammered out with N9CR during various coffee breaks. He has a newly installed three-element tribander atop a 60' tower. We chose to compare the relative merits of the elevated-feed vertical antenna to those of the beam 60 feet in the air.

Theoretical data for this comparison came from *The ARRL Antenna Book* and and P. H. Lee's book, *The Amateur Radio Vertical Antenna Handbook*.[6,7] The summary is presented below. We chose the 20-meter band for this comparison.

A three-element beam 1λ above ground has a vertical pattern consisting of two lobes. Only the lower lobe is good for DX. It has a horizontal beamwidth of about 60° (−3-dB points) and a vertical beam width of about 15° in the lower of the two lobes. Judging by the published patterns, we assumed that the power going into the antenna is divided equally between the two vertical lobes.

The beamwidth of the elevated-feed vertical antenna on 20 meters is approximately 20° in the vertical plane. Since it is non-directional, the horizontal beamwidth is 360°.

For DX operation, the spherical area illuminated by the beam is $60° \times 15° = 900$ "square degrees." The spherical area illuminated by the elevated-feed antenna is $20° \times 360° = 7200$ "square degrees." The power gain of the beam relative to that of the elevated-feed antenna can be calculated theoretically as

$$\text{Gain (dB)} = 10 \log P_1/P_2$$
$$10 \log 7200/900$$
$$9.03 \text{ dB over elevated feed}$$

Because only half of the power (3 dB down) goes into the "useful lobe," the actual gain that the beam realizes over the elevated-feed vertical antenna is 9.03 dB − 3.0 dB = 6.03 dB, or 1 S-unit.

Jokingly, we both agreed that although N9CR's tribander at 60 feet had a gain of 6 dB over my elevated-feed vertical, I held a 13.3 dB "gain advantage" in cost.

On the air, the antenna performed beautifully for DX on 28 MHz and 21 MHz where the radiation is at low vertical angles. On 14 MHz, the antenna performed very well over the United States and Canada, and fairly well for DX. On 7 MHz and 3.5 MHz, the antenna lays down a strong ground wave; I had very good signal reports from stations 30 to 40 miles away. Many fine 80- and 40-meter QSOs were also had with stations as far as 800 miles away.

### Conclusion

I wish to express my thanks to K9CGD to whom this project was first presented and who encouraged me to proceed with it. Thanks are also due N9CR who nursed the project from the beginning to the end and who, having tried the antenna on the air, pronounced that "...it worked as expected." I feel that the elevated-feed principle has much to offer to the amateur radio operator. In fact, I like this antenna so much that I am planning to optimize performance on 20 and 40 meters by designing and building one which will be 66 feet tall. But that's another project. ■

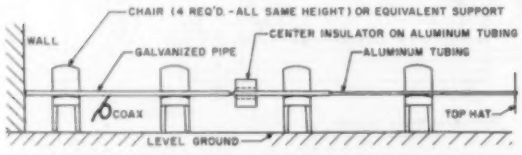


*Fig. 11. Assembly of the elevated-feed antenna.*

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1. *Amateur Radio Techniques*, an RSGB Publication, Fifth Edition, 1974, pp. 233-234.
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3. *The ARRL Antenna Book*, 1968 edition, pp. 32-33.
4. *Ibid.*, p. 100.
5. *The Amateur Radio Vertical Antenna Handbook*, Capt. Paul H. Lee, USNR, K6TS, Cowan Publishing Corporation, 1974 edition, p. 94.
6. *The ARRL Antenna Book*, pp. 46-48 and 56-58.
7. *The Amateur Radio Vertical Antenna Handbook*, pp. 11-13 and 18-19.

*Paul Grupp KA1LR*
*73 Magazine Staff*

# The TET SQ-22 Antenna

## —walking the dog with a two-meter quad

The HB9CV Swiss quad designs have been around for quite a while, but they have seen relatively little commercial exploitation in the USA. Available and quite popular in Japan for several years, they are now offered here by TET USA of Norman, Oklahoma.

The TET SQ-22 two-meter antenna is a vertically-polarized Swiss quad antenna that follows the HB9CV design. It consists of two two-element assemblies in a phased configuration, with all four elements driven. The antenna is very compact, yet the gain and front-to-back ratio figures claimed are impressive—16 dB forward gain and 20 dB front-to-back ratio. Without a test range, these figures are impossible to either confirm or deny, although they do seem slightly optimistic. Nevertheless, with the antenna mounted six feet atop a house and turned with a small TV-type rotator, gain and F/B ratio appear to be excellent.

Assembly presented no problems. The parts were carefully marked and packed, and the quality of materials used is higher than average. Assembled exactly according to instructions, the center frequency of resonance was about 146 MHz, a reasonable compromise. Since I rarely operate FM below 146 MHz, I retuned the antenna for a slightly higher center frequency.

After several months of operation, the SQ-22 has given no cause for complaint. I use it constantly for accessing repeaters and simplex operation and have never wished for more gain. If you're in the market for an antenna for two-meter FM and want something a little beyond the ordinary, you might want to look into the SQ-22. For the truly adventurous, an eight-element Swiss quad for two meters is available from TET, as well as Swiss quads for several other bands from 20 meters to 432 MHz.

For more information, contact *TET USA, 425 Highland Parkway, Norman OK 73069.* Reader Service number 476. ■

*N1BEJ with the TET SQ-22 two-meter antenna.*

Glenn Malme W6OJF
9337 Gotham Street
Downey CA 90241

# Newcomer to Nicads?

## —you'll get a charge out of this informative overview

The following covers some of the more common problems encountered by users of nicad batteries. The last section of this article explains some of the technical aspects of the nicad cell.

Virtually all problems involving batteries come with complaints like: "Battery life too short"; "Won't hold a charge"; or perhaps, "Battery too weak." Sometimes there is a real problem—and sometimes the battery is not getting what it must to do a good job.

Here are some practical tips:

1. Fully charge the battery. Some chargers have a NORMAL-TRICKLE switch. In the TRICKLE position, it would take 24 to 60 hours to fully charge a dead battery. On NORMAL, it would take 12 to 14 hours. Nicad batteries can be charged continuously at the NORMAL rate with absolutely no damage to the batteries whatsoever. Leaving the radio on while charging will cause the charging rate to be longer.

2. Don't over-discharge the batteries. Turn OFF the radio when the batteries become low (the SQUELCH control usually won't silence the radio).

3. Never insert batteries backwards. This will almost certainly ruin something.

4. Inspect your batteries occasionally for any indication of rust or corrosion. A white, powdery deposit around the rubber seal at the positve end of the cell or an oily discoloration on the label may be the first sign of an upcoming failure.

5. If your batteries have a short life, check the battery-charging system. Two simple checks will be enough to find the problem. First, check to see if the charger is putting out enough current. Second, check to see if the radio draws too much current. If the charger and radio are OK and you are allowing enough time on charge, then the battery is probably at fault.

| | |
|---|---|
| Fully discharged, open-circuit | *1.2 V |
| Fully charged, open-circuit | *1.27 V |
| Fully charged, charging at 0.1 C | 1.45 V |
| Freshly charged, begin discharging at C | 1.4 V |
| Fully discharged, discharging at C | 1.0 V |

*These voltages are reached slowly as the cell is allowed to stand for a time.

*Table 1. Cell Voltages at 20°C.*

### What is a Nicad Battery?

The nicad battery is two or more nicad cells connected together. The nicad cell is called a secondary (storage) cell and is used to store electrical energy until needed. It may be recharged many times during its life. The cell may be described electrically by its voltage and capacity.

Cell voltage is determined solely by the materials from which the cell is made. Nickel and cadmium in a potassium-hydroxide electrolyte produce a cell with a nominal voltage of 1.2 volts. There is only a relatively small change in cell voltage from fully-charged to discharged conditions. Refer to the section on battery-testing (following) for cell voltage-measuring techniques. Cell voltage varies from 1.4 volts when just charged to 1.0 volts, at which point it is considered discharged. Nominal cell voltage is 1.2 volts since the cell is very near 1.2 volts for most of the time it is in use. (Of course, if you have a 10-cell battery, the battery voltage is nominally 12 volts.)

Cell capacity is defined as the maximum current the cell will deliver continuously for one hour. This capacity is given by the battery manufacturer in milliampere-hours (mAh) for small cells, and Ampere-hours (Ah) for large cells. Capacity is determined by the size of the cell. For example, an AA-size cell is rated around 350 to 500 mAh and a D-size cell is rated at 2.0 to 4.09 Ah. A very important figure associated with cell capacity is the one-hour discharge rate (C) which is numerically equal to the capacity. For example, for a quantity, C, we can discuss the charge and discharge of nicad cells conveniently without concern for actual cell capacity.

### Temperature

Battery operation should be at temperatures between minus 20 and plus 40 degrees C. They may, however, be stored indefinitely at temperatures between minus 60 and plus 60 degrees C. Most batteries will self-discharge at rates dependent upon the storage temperature involved. At 0° C, discharge amounts to 90% in 60 days. At 20° C, it is 50% in about 55 days, and at 50° C, it is 50% in about 20 days.

**Life**

Generally, batteries may be expected to last several years under normal use. A minimum of 300 cycles of complete charge and discharge is to be expected. If only a partial (say, 20%) discharge is used, the life may extend to 5000 cycles. However, if the battery is partially discharged continuously, it should be periodically deep discharged to realize its full capacity.

**Charge and Discharge**

Most batteries are normally discharged (in-circuit) at rates less than C and charged at a rate of 0.1 C. If a trickle charge option is available, the charge rate is 0.01 to 0.05 C. Most batteries may be left on NORMAL (0.1 C) charge for indefinite periods without damage. At the normal rate, a completely discharged battery will recharge in 12-14 hours. Less time is required for partially discharged batteries. Charge rates above 0.1 tend to overheat the cell and cause damage. Special "Rapid-Charge" cells are required for fast-charging applications.

Table 1 (showing cell voltages) may be of help in understanding battery function during charge and discharge.

**Testing**

The battery, charger, and radio constitute a small system which is one end of a communication link. When this system fails, testing each element is necessary to determine the proper correction. Based on experience, the charger is the most likely to fail, followed by the battery and then the radio. However, due to ease of testing, test the charger and radio first.

For the 12-volt, hand-held radio chargers, connect a milliammeter using a D'Arsonval movement (such as: Simpson 260 or Triplett 630), capable of measuring 55 mA, in series with a 240-Ohm, 1-Watt resistor. Connect the meter-resistor combination across each and every set of charging contacts for a 12-volt battery. Observe correct polarity. The charger current should be 45-55 milliamperes.

Consult the appropriate data sheet for the radio under test. Measure all applicable maximum current drain on: full squelch receive, full volume receive, and transmit. Readings should not exceed spec maximums.

A quick battery check would be: Charge at normal (0.1 C) rate for 15-30 minutes. Measure battery or cell voltage. Less then 1.2 volts per cell (12.0 volts for a 10-cell battery) indicates possible defective cells.

For a more complete battery test for a hand-held radio battery with 10 AA cells, fully charge the battery for 12-14 hours at the normal (0.1 C) rate. Connect a 27-Ohm, 10-Watt resistor across the battery and monitor the time required to discharge the battery to 1.1 volts per cell. The time should be close to 60 minutes.

This test will vary according to ambient temperatures. The time will run short if the ambient temperature is much over 25 degrees C, or if started with the battery more than slightly warm to the touch.

**Conclusions**

The nickel-cadmium batteries will perform excellently if used within their limitations. Poor performance usually results when the limits are exceeded. ■

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**TR-9000** *from page 32*

supply and standby and power switches, as well as provisions for using external headphones. Another source of memory backup power is the BC-1 power adapter. We suspect that a functional equivalent of the BC-1 could be homebrewed for much less than the $20 list price. One accessory that Kenwood does not offer but in our experience is helpful for weak signal work is a receiver preamplifier. A quality unit can really enhance SSB operation without adding to the noise figure.

We liked the compatibility that Kenwood built into the TR-9000. The power cord and touchtone connector are the same as those used with the TR-7600 and the 7625. The microphone is identical to that used with the TR-7800 and can be pressed into service with Kenwood's VS-230 remote digital vfo. One exception to this area is the rather unusual connector used for the backup power supply.

The TR-9000 offers a tremendous number of features for a reasonable if not downright inexpensive price. If you want to take a crack at two-meter SSB and CW operation and still have a radio that allows you to chew the rag with the gang on the local repeater, you'll find a *flexible* answer in the TR-9000.

For further information, contact *Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton CA 90220.* ■

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**BC-350** *from page 78*

outs to signal priority, lockout, delay, auxiliary, and channel number. The right-hand display may be manually toggled between digital frequency display and alpha readout.

**A Closer Look**

A glance inside the custom diecast metal cabinet reveals the complexity of the circuit, but shows the precision of professional design.

Frequency increments searched and programmable vary with the band plan procedure. On low and high band FM, channel spacing is 5 kHz, on aircraft band 25 kHz, and on UHF 12.5 kHz.

An automatic squelch circuit may be called up to respond to any signal level which produces 20 dB SINAD (S + N/N). This is handy for most listening requirements which do not require constant juggling of the squelch sensitivity right at threshold.

Frequency coverage was actually somewhat greater in our evaluation unit than advertised. We programmed 30.0-50.995, 118.0-136.995, 144.0-174.005, and 420.45-512.9875 MHz. This allowed reception of the first megahertz of the six-meter band (FM demodulation only) and a few beeps and whistles from NASA's weather satellites!

As with its predecessor, the advanced BC-300, the BC-350 has a non-volatile memory—no batteries to change.

The BC-350 is advertised for $599.95. For more information, contact *Electra Company, PO Box 29243, Cumberland IN 46229.* Reader Service number 480. ■

# FUN!

*John Edwards KI2U*
*78-56 86th Street*
*Glendale NY 11385*

"Don't you ever run out of material for your column?" is a question that often crosses your FUN! editor's desk. The answer, quite honestly, is "no." Amateur radio is a subject so full of history and interesting bits of information that, quite likely, the well will never run dry. After all, new ham facts are being created every day.

Take our monthly crossword puzzle. Each month a new topic; each month a new puzzle. Oh, occasionally we may repeat a word or clue here and there, but, on the whole, each month's puzzle is entirely different. And we're never really stuck for material.

Do you know where the world's first crossword was printed? Why, in the FUN! column, of course! No, not this FUN!, but one carried in the December 21, 1913, *New York World*. It's nice to be carrying on a tradition.

Now, what has all this to do with this month's topic, emergency communications? Absolutely nothing. It's just that we occasionally like to digress.

### ELEMENT 1—CROSSWORD PUZZLE
### (Illustration 1)

**Across**

1) Emergency messages
2) Mobile antenna
7) Box (abbr.)
9) Where third-party info is entered
11) Emergency's cause
14) Distantly activated (abbr.)
15) ARRL state (abbr.)
16) Over
18) Quasi-military service (abbr.)
21) Emergency service (abbr.)
23) Military colors
26) Strong signal needle action
28) Radiogram
31) Tell you later (abbr.)
33) "_____ the traffic"
35) Brick _____
38) 42 across often needs this (abbr.)
40) Plate voltage (abbr.)
42) Emergency ringleader (2 words)

**Down**

1) Dits and dahs
2) Erstwhile training contest (abbr.)
3) Old-style Hertz (abbr.)
5) Active circuit condition
6) Desirable emergency gear is this
8) Flood boat's meager propulsion
10) Emergency workers need this (abbr.)
11) Light-bulb action in many emergencies
12) 4-land state (abbr.)
13) ARRL emergency official (abbr.)
17) Peruvian prefix
19) League post (abbr.)
20) Here (abbr.)
22) Big emergency "nuisance"
24) Mode: most 2-meter CD nets (abbr.)
25) Baloney (abbr.)
27) Popular rig prefix
29) Female version: frequency hog
32) End of message
34) Organized roundtable (abbr.)
36) Automatic noise limiter (abbr.)
37) Jams emergency traffic
38) An engineering degree (abbr.)
39) Board type (abbr.)
41) Many clubs use emergency work to gain this (abbr.)

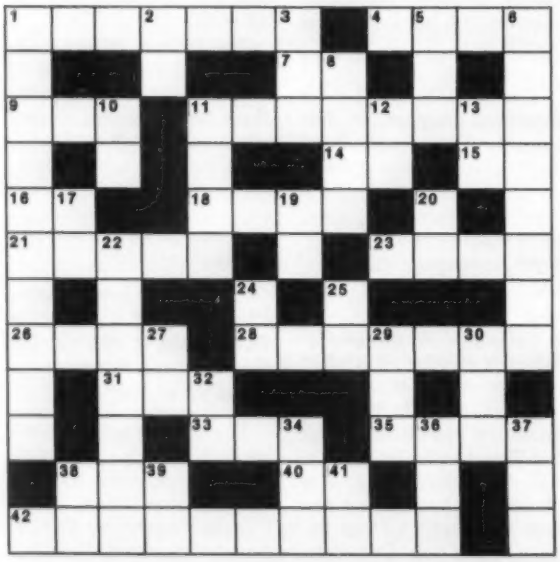


*Illustration 1.*

### ELEMENT 2—MULTIPLE CHOICE

1) We all know that SOS is the distress signal, but what is the urgency signal, signifying a message concerning the safety of a ship or person?

1) TTT
2) XXX
3) URG
4) There's no such thing as an "urgency" signal.

2) While tuning across the band, you hear someone shouting, "Pan, Pan, Pan." What's happening?

1) He's sending an urgency message
2) He's looking for a kitchen implement to fry his eggs in
3) He's calling for an open frequency
4) He's using an international sign that means he's listening 10 kHz up

3) What does SOS stand for?

1) Save our ship
2) Save our souls
3) Secure our safety
4) The individual letters mean absolutely nothing, chosen only for their distinctive sound

4) What were the official Conelrad broadcast frequencies?

1) 540 and 880 kHz
2) 640 and 1240 kHz
3) 710 and 1600 kHz
4) 21.390 and 146.52 MHz

5) How did the word "Conelrad" originate?

1) It's an abbreviation of control of electromagnetic radiation
2) It's an abbreviation of consolidated network for limiting radio
3) From its founder, Joseph Conelrad
4) From the Conelrad video display located at each participating radio station

## ELEMENT 3—TRUE-FALSE

| | | True | False |
|---|---|---|---|
| 1) | The original official ARRL station, W1MK, was destroyed by a flood. | _____ | _____ |
| 2) | RACES is an ARRL organization. | _____ | _____ |
| 3) | If caught in a life or death situation, you're allowed to operate in any amateur subband, even if it's outside your license privileges. | _____ | _____ |
| 4) | QRRR was the original amateur distress call. | _____ | _____ |
| 5) | Before SOS, the international distress call was CQD. | _____ | _____ |
| 6) | "Mayday" is the phone distress call in honor of Marconi, who was born on May 1, 1870. | _____ | _____ |
| 7) | MARS used to be called AARS. | _____ | _____ |
| 8) | Novices may not pass emergency traffic. | _____ | _____ |
| 9) | In an emergency, the FCC may order all U.S. amateurs off an entire band. | _____ | _____ |
| 10) | The *Titanic's* SOS was the first ever sent by a ship at sea. | _____ | _____ |
| 11) | Alaskan amateurs may use 4,383.8 kHz for emergency communications at any time. | _____ | _____ |
| 12) | In RACES, the amateur controlling on-scene emergency communications is called the "Master of Ceremonies." | _____ | _____ |
| 13) | The "Transcontinental Corps" is a radio club dedicated to helping hams in need. | _____ | _____ |
| 14) | ARRL numbered radiograms violate the FCC's rules prohibiting secret codes and ciphers. | _____ | _____ |
| 15) | If a natural disaster strikes a foreign country, third-party emergency traffic can be passed—even without a formal agreement. | _____ | _____ |

## ELEMENT 4—SCRAMBLED WORDS

Unscramble these words dealing with things hams might bring to an emergency site.

| | | |
|---|---|---|
| rotnegera | toobs | dofo |
| stranvercei | wobtoar | shalltifgh |
| nett | loots | hotnicgl |
| | dicnemie | |

## ELEMENT 5—HIDDEN WORDS
**(Illustration 2)**

Hidden in this puzzle are the names of 10 different types of emergencies. The words are formed in any direction—horizontally, vertically, or diagonally, forwards or backwards. As you find each word, circle it.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | A | C | A | D | R | A | Z | Z | I | L | B | E | F | N |
| P | Z | A | P | F | M | F | U | A | L | H | E | A | L | D |
| S | M | L | R | O | V | F | E | R | E | R | S | P | M | J |
| A | C | E | U | C | B | H | I | E | R | R | I | A | Y | M |
| U | P | D | R | E | Y | A | O | R | U | G | H | B | R | O |
| E | A | R | T | H | Q | U | A | K | E | Q | T | A | I | C |
| H | D | Y | S | U | E | J | U | C | H | E | U | C | S | I |
| U | T | I | C | R | C | N | D | K | D | L | O | H | E | T |
| Y | Y | F | E | R | R | I | L | O | I | C | K | E | N | O |
| D | P | G | H | I | S | I | O | Y | E | K | C | S | D | D |
| A | H | W | H | C | H | L | C | Y | M | L | A | Y | G | A |
| Y | O | E | L | A | F | C | I | E | R | U | L | M | T | N |
| F | O | A | O | N | S | S | H | R | O | N | B | T | O | R |
| M | N | O | F | E | X | P | L | O | S | I | O | N | U | O |
| H | N | G | I | B | E | S | A | L | L | K | J | O | H | T |

*Illustration 2.*

## FUN! MAILBOX

Just a note letting you know your work is greatly appreciated in *73 Magazine*. I enjoy your writing. I am studying for my General and would like to have an Advanced someday. There is a lot to learn and I am trying to crawl!

Keep up the good work. Thank you very much.

James Ross
Long Beach CA

*Thanks a lot, Jim.—J.E.*

## THE ANSWERS

*Element 1:*
See illustration 1A.

*Element 2:*
1-2 Many hams might send XXX after sitting at their key for more than a few hours. Others just have it written on that jug near their operating station.
2-1 Did we get you again? Of course, he may just be looking for his peanut butter.
3-4 And QSB must mean: "Quickly Sinking Band."
4-2 There you would listen to the president's message—if your receiver wasn't melted by the blast.
5-1 So enemy planes couldn't find our cities via radio. But how would you have shut down the CBers?

*Element 3:*
1 True—No code practice that night.
2 False—The FCC, when it feels like it.
3 True—If absolutely necessary, you can even operate outside the amateur bands.
4 True—Like SOS, it had a distinctive sound.
5 True—As you may have guessed, it meant "CQ Distress."
6 False—From the French *m'aidez* (help me).
7 True—Back before WWII, when it was the Army Amateur Radio System.
8 False—Why not?
9 True—The FCC, like a 500-pound canary, can do anything it wants to.
10 True—Alternating with CQD.
11 True—As long as they're within 50 nautical miles of the state and are not airborne.
12 False—Only if he has a co-host.
13 False—They're upper-level ARRL traffic handlers.
14 False—Probably not, since the codes are regularly printed. But they're never been challenged on it, either.
15 False—Unfortunately not, and many unwitting amateurs end up violating the law. Usually, however, a temporary agreement permitting emergency traffic is put into place—as in last year's Italian earthquake.

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T | R | A | F | F | I | C | ■ | W | H | I | P | | |
| E | ■ | ■ | D | ■ | ■ | P | O | ■ | O | ■ | O | | |
| L | O | G | ■ | D | I | S | A | S | T | E | R | | |
| E | ■ | L | ■ | I | ■ | ■ | R | C | ■ | C | T | | |
| G | O | ■ | ■ | M | A | R | S | ■ | H | ■ | A | | |
| R | A | C | E | S | ■ | M | ■ | D | R | A | B | | |
| A | ■ | O | ■ | ■ | F | ■ | B | ■ | ■ | ■ | L | | |
| P | I | N | S | ■ | M | E | S | S | A | G | E | | |
| H | ■ | T | B | A | ■ | ■ | ■ | O | ■ | A | ■ | | |
| Y | ■ | E | ■ | R | U | N | ■ | W | A | L | L | | |
| ■ | E | S | P | ■ | ■ | E | P | ■ | N | ■ | I | | |
| N | E | T | C | O | N | T | R | O | L | ■ | D | | |

*Illustration 1A.*

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R | A | C | A | D | R | A | Z | Z | I | L | B | E | F | N |
| P | Z | A | P | F | M | F | U | A | L | H | E | A | L | D |
| S | M | L | R | O | V | F | E | R | E | R | S | P | M | J |
| A | C | E | U | C | B | H | I | E | R | R | I | A | Y | M |
| U | P | D | R | E | Y | A | O | R | U | G | H | B | R | O |
| E | A | R | T | H | Q | U | A | K | E | Q | T | A | I | C |
| H | D | Y | S | U | E | J | U | C | H | E | U | C | S | I |
| U | T | I | C | R | C | N | D | K | D | L | O | H | E | T |
| Y | Y | F | E | R | R | I | L | O | I | C | K | E | N | O |
| D | P | G | H | I | S | I | O | Y | E | K | C | S | D | D |
| A | H | W | H | C | H | L | C | Y | M | L | A | Y | G | A |
| Y | O | E | L | A | F | C | I | E | R | U | L | M | T | N |
| F | O | A | O | N | S | S | H | R | O | N | B | T | O | R |
| M | N | O | F | E | X | P | L | O | S | I | O | N | U | O |
| H | N | G | I | B | E | S | A | L | L | K | J | O | H | T |

*Illustration 2A.*

*Element 4:*
(Reading from left to right) generator, boots, food; transceiver, rowboat, flashlight; tent, tools, clothing; medicine.

*Element 5:*
See illustration 2A.

**SCORING**

*Element 1:*
Twenty points for the completed puzzle, or ½ point for each question correctly answered.

*Element 2:*
Four points for each correct answer.

*Element 3:*
One point for each correct answer.

*Element 4:*
Each word deciphered nets you 2½ points.

*Element 5:*
Two points for each word found.

So, how well are you prepared?

1-20 points—Emergency? What emergency?
21-40 points—Know someone who passed a message during the great 1951 Philadelphia Hoagie Famine
41-60 points—Regularly checks into local VHF net to "pass a personal"
61-80 points—Spends every night hopping from net to net—your handle is "Sparks"
81-100+ points—Member of RACES, MARS, AREC, NTS, ARPSC, and the National Anagram Society

# LEAKY LINES

*Dave Mann K2AGZ*
*3 Daniel Lane*
*Kinnelon NJ 07405*

Perhaps some of you who are reading these lines will have been among the group of twenty-odd hams who happened to be standing around the booth of a company which I prefer to go unnamed. The scene was the recent Dayton Hamvention, and the time was Saturday afternoon at the very height of the afternoon festivities. This particular firm is one of the few remaining American manufacturers engaged in the production of major equipment, that is to say, transceivers, as distinguished from associated items such as microphones, antennas, keyers, and so forth.

Their current model is not new, but has been on the market for some time. But I have had little opportunity to look at it, so this was really the first time for me to see it close up. I was chagrined to see that among other things, they had seen fit to include a pretty shoddy-looking silk-screened knob that probably cost no more than a few pennies to produce. This was the sort of penny-dreadful junk one would only find on inexpensive kits and cheaper rigs. It was certainly grossly out of place on a radio which sells for upwards of 1600 bucks, in my humble opinion. (Actually I've never been humble in my whole life; this figure of speech just happened to issue forth from the typewriter.)

At the precise moment that my eyes happened to light on this misbegotten knob, I was suddenly overcome by an uncontrollable impulse to lash out at someone, and since the only eligible person happened to be the company rep who was manning the booth, he was elected. I said, "You know...you and your company ought to hang your heads in shame. Here we are: The Japanese have their fangs and talons poised at our jugular. We keep talking about the urgent necessity of regaining the markets that foreign business has taken from us. In scores of fields: optics, photography, automobiles, electronics...even pianos and sporting goods such as fishing tackle and baseball gloves...we have lost out, and now we suffer disadvantage, not only to our pocketbook, but our national pride."

The luckless object of my polemic seemed to be looking for a hole to crawl into. His eyes were bugging out of his head. I continued.

"We know that the reason there are so many VWs, Datsuns, and Toyotas on the road is because of the rotten product that Detroit insisted on making.

We drove the car customers right into the arms of the foreign producers. And now what happens? You guys have the gall to do the very same dumb thing that Detroit did, despite the clear and certain knowledge that the American people were sick and tired of getting shafted by our own companies and shifted to imports. You put out a rig that looks as if it were slapped together in someone's garage! You ought to hang your heads in shame!"

I surreptitiously peered at the people standing around the booth and they were all nodding in agreement. I could see that if I continued much longer, this gang might start heating up the tar and ripping open the pillows. So I decided to call a halt to my diatribe, and I walked away, leaving the poor guy swabbing the sweat from his brow.

About a year ago, when I was putting together a little switching arrangement so that I could go from HF to VHF on radioteletype, I needed to get hold of a switch and figured that in the interest of durability and reliable operation I'd better get myself a good American-made one. There were plenty of switches available that would have done an adequate job, but I thought that I would do better with a device of proven reliability. So I spurned all the cute little miniswitches and went to a good store and laid out almost six bucks for an American-made switch. (Again, I will leave the name of the company unspoken.) Well. . . you guessed it. The switch was an absolute dog! It was constantly intermittent, and I could never be certain that it would make contact. I had to spend much time jiggling the damned toggle back and forth to make sure that the thing switched properly. Please bear in mind that there was no appreciable voltage or current involved, since I was merely activating a pair of sensitive relays that operated from the 13.8-volt 2-meter supply, and since the actual switching took only a split second, there was no way that any operational stress could have played a part in the failure of the device. Any light switch in my house gets more use in a single week than this switch would be likely to get in a whole year!

So what did I do? Simple. I ripped the high-falutin' American-made switch out of the gadget and replaced it with a cheap little import picked up in a blister pack from my handy-dandy neighborhood Radio Shack store. It has now been in use for about three months with no sign of any difficulty. And it cost all of 98 cents, as I recall.

I am outraged. I guess it's no secret that there are more foreign rigs being sold in the US than ever, and it's pretty clear that hundreds of millions of hard-earned American dollars are leaving the country and going into foreign pockets. There's no doubt that this constant drain (and you can multiply it by a large factor because the very same situation can be observed in all sorts of manufactured goods, as I indicated earlier) is virtually crippling the American economy. While our national administration struggles to bring the economy into line by increasing productivity and reducing inflation, we are ignoring this fundamental fact: that American productivity must go hand in hand with quality. For if we produce shoddy merchandise, buyers are entitled to go elsewhere. They yearn to be patriotic, but that does not mean that they will hold still while they are being exploited.

Somehow, American manufacturers of ham gear are going to have to find a way to produce top-quality goods at a price which can compete on an equal basis with the imports. It isn't going to be easy.

By the way, while at the Hamvention, I looked at another line of goods, also produced by an American company. In line with my previous demurral, I will not divulge their name. They had removed the covers so that it was possible to see the circuit boards. I can tell you that I was appalled at the shoddy appearance of the workmanship, if you can dignify it with that term. This is supposedly top-line stuff. Mounted components looked as if they had been scrounged from someone's tailgate out in the flea market, and without particular care in selecting them. Cockeyed, poorly-dressed leads and solder splashes were the rule rather than the exception, and some of the visible hardware had been deformed by the careless application of the wrong-sized screwdrivers.

I have often looked carefully at imported equipment, and I must say that even the most inexpensive gear is generally immaculately assembled and good to look at. Is that too much to ask?

### RADAR AND LIVES

I swore that after last year's trip, I would never drive to Dayton again, but would fly. But when the time approached, I forgot all about the resolution. Thirteen hours on the road is getting to be a mite exhausting. And I have yet to ride on Interstate 80 without encountering either a horrendous downpour or impenetrable fog.

Last year, we went in a couple of rented Winnebago RVs. The trip was fun, albeit very tiring, not to mention the horrendous cost of the gasoline. This year, we used two cars. The most impressive thing was the performance of the radar detectors mounted in each of the automobiles. They operated flawlessly, and I am convinced that they are a must, particularly if the vehicle is not equipped with cruise control. The gadgets never failed to alert us to the presence of police radar. I am in no position to give you qualitative comparisons of the brands, not having tried a great variety. But Wayne gave a fairly broad evaluation in one of his columns (June, 1980) and it behooves anyone who is anxious to avoid a nasty confrontation with the gendarmes to consider the purchase of one of these devices.

There are still a few places in which radar detectors are considered illegal. I suppose the authorities consider the collection of fines more important than the prevention of highway accidents. It is obvious that the known presence of radar patrols influence drivers to slow down, thus reducing the accident rate. The fact that most cars I saw on this trip were indeed equipped with detectors and the additional fact that few cars were pulled over by the police must be correlative. I am positive that radar detectors are a demonstrably effective deterrent to traffic fatalities.

Indeed, we can all think of far more urgent jobs for the police to be doing than lying in wait for unwary motorists who are "putting the pedal to the metal." While the original impulse to buy and use a radar detector may be ignited by the simple desire to avoid traffic citations, the end result is fewer accidents. And since the use of detectors by the public invariably results in a lessening of the need for high numbers of police patrolling the roads, this will liberate more officers and make them available to track down the ever-increasing population of real criminals who terrorize society and who run amok in our streets, parks, and subways, creating havoc and tragedy.

If that is the consequence, then every car in America ought to be equipped at the factory with a radar detector.

### NO-CODE LICENSES

The response to my April piece about code-free licensing has been practically unanimous. Numerous cards and letters have come in, and only three favored a code-free entry level license. In point of fact, the results of a survey (published in *QST*) showed conclusively that the vast and overwhelming majority of amateurs opposed such a change.

Case closed!

## HAM HELP

I'm interested in any information on converting an RCA RT-175/PRC-9 27-38.9-MHz receiver/transmitter. My particular interest is in power supplies and schematic information on these radios. Thank you for your trouble.

**Dick Howe**
**2210 Taggert St.**
**Wesleyville PA 16510**

I am interested in obtaining a schematic for a Precision Signal Generator, series E-200 C, manufactured by Precision Apparatus Co., Inc., Elmhurst, LI, New York, serial number 34845. I would appreciate any help that anyone can give me. Thanks.

**A. B. Wells WA5COH**
**PO Box 50**
**Tunica LA 70782**

# CONTESTS

*Robert Baker WB2GFE*
*15 Windsor Dr.*
*Atco NJ 08004*

### SARTG WORLDWIDE RTTY CONTEST

**Contest Periods:**
**0000 to 0800 GMT August 15**
**1600 to 2400 GMT August 15**
**0800 to 1600 GMT August 16**

This is the 11th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group (SARTG). Operating classes include: (a) single operator; (b) multi-operator, single transmitter; (c) SWL. Please note that the logs from multi-operator stations must contain the names and callsigns of all operators involved. The same station may be worked once on each band for QSO and multiplier credits. Only 2-way RTTY QSOs will count.

*EXCHANGE:*

RST and QSO number.

*SCORING:*

QSOs with your own country count 5 points. Other countries in the same continent are 10 points. Other continents are 15 points. In the USA, Canada, and Australia, each call district will be considered as a separate country. Use the DXCC list and the above-mentioned call areas for multipliers. Note that contacts with a station which would count as a multiplier must be found in at least 5 logs or a contest log must be received from the multiplier station in order to be valid. Final score is the sum of QSO points times the sum of the multipliers. SWLs use the same rules for scoring, but scores are based on stations and messages copied.

*AWARDS:*

Top stations in each class, country, W/K, VE/VO, and VK call district.

*ENTRIES:*

Logs must be received by October 10th and should contain: band, date/time in GMT, call-

# CALENDAR

| | |
|---|---|
| **Aug 8-9*** | **European DX Contest—CW** |
| **Aug 15-16** | **SARTG Worldwide RTTY Contest** |
| **Aug 15-17** | **Rhode Island QSO Party** |
| **Aug 15-17** | **New Jersey QSO Party** |
| **Aug 22-23** | **Ohio QSO Party** |
| **Aug 29-30** | **Occupation Contest** |
| **Sep 12-13** | **European DX Contest—Phone** |
| **Sep 12-13** | **G-QRP-Club CW Activity Weekend** |
| **Sep 12-13** | **New Mexico QSO Party** |
| **Sep 12-14** | **Washington State QSO Party** |
| **Sep 19-20** | **Maryland-District of Columbia QSO Party** |
| **Sep 26** | **DARC Corona—10-Meter RTTY** |
| **Oct 3-4** | **California QSO Party** |
| **Oct 17-18** | **Minnesota QSO Party** |
| **Oct 17-18** | **Scout Jamboree on the Air** |
| **Oct 24-25** | **CQ Worldwide DX Contest—Phone** |
| **Nov 8** | **DARC Corona—10-meter RTTY** |
| **Nov 8** | **OK DX Contest** |
| **Nov 14-15** | **European DX Contest—RTTY** |
| **Nov 28-29** | **CQ Worldwide DX Contest—CW** |
| **Dec 26-31** | **G-QRP-Club Winter Sports** |
| **Jan 16-17** | **73's International 160-Meter Phone Contest** |

***see last issue**

# RESULTS

### 1981 SSTV CONTEST RESULTS

This year's SSTV contest may not have been the pinnacle of excitement and fun as it has been in previous years, but it brought several situations into clear focus (no pun intended). As you know, the SSTV Contest and Worldwide DX Contest happened during the same weekend. What you don't know is the problems and entanglements of trying to coordinate with uncoordinative sources. We've outguessed and outmaneuvered obstacles during the past several years, but the law of numbers finally caught us. We have two possible considerations for next year's contest: 1) Conduct the SSTV Contest on either the first or second full weekend of March, whichever one doesn't become scheduled for the DX (phone) Contest. Furthermore, if some "surprise attack" produces contests on both of these weekends, the SSTV Contest will shift to the third weekend of March. If that consideration is accepted, the formal 1982 SSTV Contest announcement will read accordingly. That will necessitate checking with the SSTV Net (Saturdays, 1800 GMT, 14,230 kHz) for specific details. 2) Forego on-the-air operational contesting and conduct a technical achievement contest. If SSTVers as a whole prefer to design, tinker, and construct rather than operate, we're ready to make the change and recognize your efforts. Your opinions and suggestions are vitally important. Please contact Dave Ingram W4TWJ or Brooks Kendall W1JKF during the Saturday SSTV Net with your comments. Now let's look at the results.

### 1981 SSTV CONTEST COMMENTS

*WB4OVX* in Virginia was noticed having a ball during the contest, showing his new Collins KWM-380. *N6WQ* related that contacts seemed down approximately 30% and felt this was due to the simultaneous ARRL DX Contest. The most *common comments* heard on the air during the contest related to the two contests (DX and SSTV) falling at the same time. *Fortunately*, however, the SSTV contesters were heard expressing their understanding and sympathy. Although we couldn't get enough forewarning from the ARRL and although 73 coordination was difficult, we still had a good contest. Respect among on-air SSTV contesters was quite commendable. A friendly and relaxed air among all SSTV contesters was apparent. *10* and *20* meters seemed (in that order) the most popular (SSTV) bands.

Thanks to everyone for contest support (whether or not you sent a log!) Congratulations to N9AWR on winning first place in the contest! Bravo!!

**Dave Ingram K4TWJ**
**Brooks Kendall W1JKF**

### 1981 SSTV CONTEST SCORES

| Call | Contacts | Countries 5 Points | Continents 5 Points | States/ Prov's | Grand Total |
|---|---|---|---|---|---|
| N9AWR | 139 | 16 (80) | 6 (30) | 36 | 285 |
| N6WQ | 112 | 14 (70) | 5 (25) | 29 | 236 |
| W2GND | 38 | 4 (20) | 3 (15) | 21 | 94 |
| XE1HT | 15 | 3 (15) | 1 (5) | 5 | 40 |
| XE1AAK | 17 | 3 (15) | 1 (5) | 7 | 44 |
| W0KXP | 8 | 2 (10) | 2 (10) | 2 | 30 |

sign, exchanges sent and received, points, multipliers, and final score. Use a separate sheet for each band and enclose a summary sheet showing the scoring, classification, callsign, name, and address. In the case of multi-operator stations, include the names and callsigns of all operators involved. Comments will be very much appreciated by the contest committee. Send logs to: SARTG Contest and Award Manager, C. J. Jensen OZ2CJ, PO Box 717, 8600 Silkeborg, Denmark.

**RHODE ISLAND QSO PARTY**

**1700 GMT August 15 to**
**0500 GMT August 16**
**1300 GMT August 16 to**
**0100 GMT August 17**

The Rhode Island QSO Party is sponsored by the East Bay Amateur Wireless Association. RI stations work other RI stations and the rest of the world. Others work RI stations only. The same station may be worked once per band and mode.

*EXCHANGE:*

Send RS(T) and state, province, country, or RI city.

*FREQUENCIES:*

Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, 146.52.

CW—1810, 3550, 3710, 7050, 7110, 14050, 21050, 21110, 28050, 28110.

Use of FM simplex is encouraged, but no repeaters are allowed.

*SCORING:*

All stations score 2 points per phone QSO, 3 points per CW QSO. RI Novice and Technician stations score 5 points per QSO. RI stations score 5 points per QSO. RI stations multiply total QSO points by the number of states, provinces, and DX countries worked. Others multiply total QSO points by the number of RI cities and towns worked. Note that there are 39 cities and towns in Rhode Island.

Certificates will be awarded to the top-scoring station in each RI county, state, province, and DX country; the top-scoring Novice and Technician station in each RI county and state; and the ARC in each state, province, and DX country that submits the highest aggregate score with a minimum of 3 logs per club.

*ENTRIES:*

Logs must show date/time in GMT, call exchange, band, and mode. On a separate sheet show name, call, mailing address, club affiliation (if any), total QSO points, multiplier claimed, and final score. Entries must be postmarked no later than September 15th. Send logs and summary to: East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for a copy of the results.

**NEW JERSEY QSO PARTY**

**2000 GMT August 15 to**
**0700 GMT August 16**
**1300 GMT August 16 to**
**0200 GMT August 17**

The Englewood ARA invites all amateurs worldwide to participate in the 22nd annual NJ QSO Party. Phone and CW are considered the same contest. A station may be contacted once on each band; phone and CW are considered separate "bands" but CW contacts may not be made in phone band segments. NJ stations may work other NJ stations, and NJ stations are requested to identify themselves as "DE NJ".

*EXCHANGE:*

QSO number, RS(T), and ARRL section, country, or NJ county.

*FREQUENCIES:*

1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50-50.5, and 144-146.

Suggest phone activity on the even hours; 15 meters on the odd hours (1500 to 2100 GMT); 160 meters at 0500 GMT.

*SCORING:*

Out-of-state stations multiply the number of complete contacts with NJ stations times the number of NJ counties worked (21 maximum). NJ stations count 1 point per W/K/VE/VO QSO and 3 points per DX QSO. Multiply total QSO points by the number of ARRL sections (including NNJ and SNJ—maximum 74). KP4, KH6, KL7, etc., count as 3-point DX contacts and as section multipliers.

*AWARDS:*

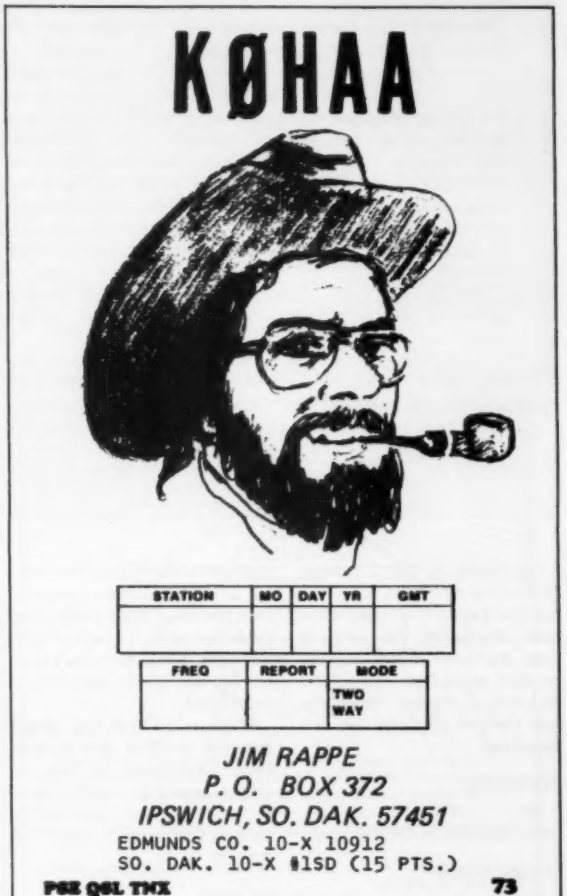
Certificates will be awarded to the first-place station in each NJ county, ARRL section, and country. In addition, a second-place certificate will be awarded when 4 or more logs are received. Novice and Technician certificates will also be awarded.

*ENTRIES:*

Logs must show date/time in GMT, band, and emission. Logs must be received not later than September 12th. The first contact for each claimed multiplier must be indicated and numbered and a checklist of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to: Englewood Amateur Radio Assoc., Inc., PO Box 528, Englewood NJ 07631. A #10-size SASE should be included for results. Stations planning active participation in NJ are requested to advise the EARA by August 1st of their intentions so that they can plan for full coverage from all counties. Portable and mobile operation is encouraged.

**OHIO QSO PARTY**

**Starts: 0000 GMT August 22**
**Ends: 2400 GMT August 23**




**QSL OF THE MONTH**

This month's QSL winner was submitted by Jim Rappe KØHAA of Ipswich SD. It's bold and carries that personal touch.

If you would like to enter the contest, put your QSL *in an envelope* and mail it along with your choice of a book from *73*'s Radio Bookshop to *73 Magazine*, Pine Street, Peterborough NH 03458, Attention: QSL of the Month. Entries which do not use an envelope (the Postal Service does *occasionally* damage cards) and do not specify book choice will not be considered. Sorry.

# THE CHAWED RAG.....

### NEWSLETTER CONTEST WINNER

We were overwhelmed by the response to the *73 Club Newsletter Contest*. The staff would like to thank the 200+ clubs who submitted material during the first month. Each, in its own way, was a winner. Keep up the good work!

Choosing a winning club newsletter is not an easy task. There are many different kinds of clubs and no two have similar newsletters. How does a judge compare the Abington Amateur Radio Club bulletin with the Kansas Amateur Radio publication? The Abington club has six members while the circulation of the Kansas newsletter is in the thousands.

Even if we could resolve the problem of different sizes, there is the problem of production quality and appearance. The Chicago Autopatch Repeater Organization Limited uses eye-catching graphics in their newsletter while the Minuteman Repeater Association publication employs a slick-looking magazine format. In establishing a set of criteria for choosing a winner in the first month of the newsletter contest, the judges made circulation, style, and looks secondary considerations. What we were looking for was the best source of *information*.

The size of your club, the budget for the newsletter, and the method of reproduction don't matter very much if you are not giving the readers something they can use.

Our August winner, *The Chawed Rag*, published by the Richardson Wireless Klub, offers more than just club news. After all, the members who are interested and involved will probably know all the minute details of what went on at the last meeting. Instead of publishing a rather boring description of who was there and what they argued about, *The Chawed Rag* highlights the club's upcoming activities. The issue we reviewed was full of enthusiastic information about Field Day.

The Richardson Klub's newsletter does not limit itself to local happenings. It offers a look at the DX world, the technical aspects of radio, and the latest FCC actions. Gathering and publishing this kind of information does not need to be a time-consuming job. The savvy newsletter editor relies on someone else to locate, research, and write up the hot ham radio stories. *The Chawed Rag* does this by reprinting material from DX newsletters, *The W5YI Report*, other clubs' bulletins, and even the local grapevine.

There are at least two-dozen specialized ham publications available for a $5- to-$25-a-year subscriptions. You can take advantage of DX tips that are only a few days old by subscribing to a weekly source of DX news. *HR Report* and *The W5YI Report* will supply you with a biweekly roundup of ham radio happenings. You can keep your members informed about the latest satellite news by excerpting material from AMSAT's *Satellite Report*. The gold mine is there; is your club newsletter making the most of it?

Because of the limited appeal of these publications, only a few of your club's members will want to subscribe. But that doesn't stop you from sharing headlines and stories. Club newsletters are in a unique position to share this information because they can print it shortly after it first appears. The major ham magazines, *73* included, have printing deadlines that make much of this material very old news if they try to publish it.

With only a few exceptions, the publications mentioned do not mind if you reprint their material, *provided credit is given.* That way, readers who want to find out more will know whom to contact. You can reprint this material directly or repackage it to fit your newsletter's style; just remember to give credit where credit is due.

Don't be afraid to offer your club members something extra. Your club's newsletter is a valuable tool—use it! Keep those newsletters coming.

Sponsored by the Cuyahoga Falls Amateur Radio Club, the contest is open to all radio amateurs worldwide. All contacts must be made direct on any amateur band from 160 to and including 2 meters. Repeaters and OSCAR contacts are not permitted.

*EXCHANGE:*

RS(T) and ARRL section, DXCC country, or Ohio county.

*FREQUENCIES:*

5 kHz up from the low end of each General class band, both on SSB and CW. Club station W8VPV will operate near these frequencies.

*SCORING:*

Score 2 points for each contact with an Ohio station. Contacts with a Falls member will be worth 10 points and contacts with W9VPV, the club station, will count 25 points. Ohio stations will score 5 points for out-of-state contacts plus the member and club stations bonuses. Multiply your QSO point total times the sum of counties (maximum 88), ARRL sections (maximum 74), and DXCC countries on each band.

Plaques to the top single operator in Ohio and outside Ohio. Certificates to the top single operator, multi-single, and multi-multi in each ARRL section, Ohio county, and DXCC country.

*ENTRIES:*

Each log must show the date/time in GMT, band and mode, plus the complete exchange. A copy of the official log sheet and reporting form are available from the club by sending an SASE. Dupe sheets must be completed for any stations with more than 300 contacts. Some form of summary sheet showing the scoring and usual signed declaration is also requested. Send a large SASE for a copy of the results. Deadline for logs is September 21st. All entries and requests for forms/logs should be addressed to: The Cuyahoga Falls ARC, PO Box 6, Cuyahoga Falls OH 44222.

### OCCUPATION CONTEST

**Starts: 1800 GMT August 29**
**Ends: 2400 GMT August 30**

The Radio Association of Erie PA is sponsoring its first contest. The club thought it might be interesting to see what kinds of work or occupations fellow hams are involved in. The contest is open to all amateur radio operators.

*EXCHANGE:*

RS(T), occupation and state, province, or country.

*FREQUENCIES:*

CW—50 kHz from the bottom of the ham bands.

Phone—50 kHz from the top of the ham bands.

Repeater contacts are not permitted; however, simplex is permissible.

*SCORING:*

Count 1 point per QSO with multipliers determined by the number of similar occupations worked. One multiplier point is given for every 5 similar occupations. Also, another multiplier point is given for every 3 retirees worked. Final score is the product of the QSO points times the total multiplier.

*AWARDS:*

A plaque will be given to the top-scoring station. Certificates for the top stations in each state, province, and country.

*ENTRIES:*

Mailing deadline for logs is October 1st and they are to be sent to: Chris Robson KB3A, 6950 Kreider Rd., Fairview PA 16415. Please include an SASE for a copy of the results.

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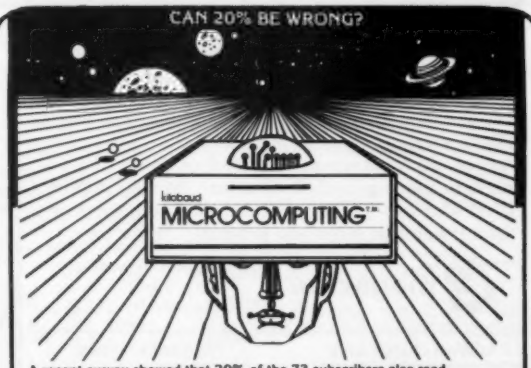


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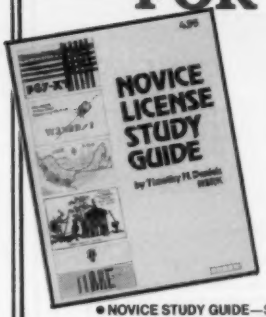


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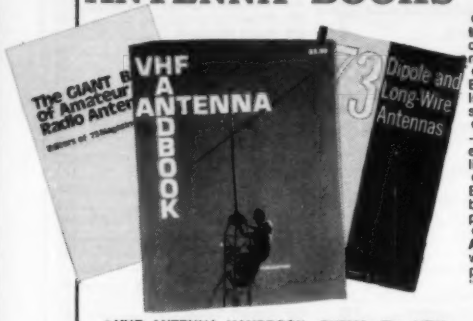


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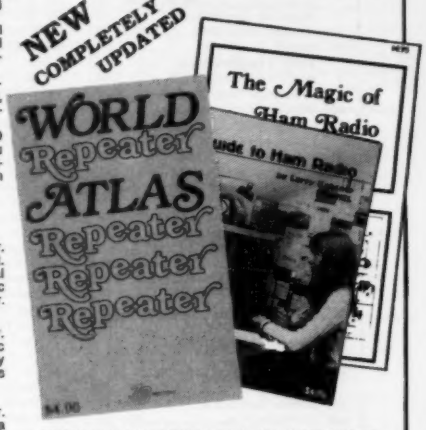


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| 467 | Amateur Electronic Supply | 49, 65, 76, 83, 139 |
| 7 | American Crystal Supply | 81, 145 |
| 334 | Amidon Associates | 138 |
| 356 | Anteck | 91 |
| * | Appli. & Equipment Co., Inc. | 146 |
| * | Associated Radio | 84 |
| * | Automated Technology, Inc. | 46 |
| 469 | BG Carl Electronics | 143 |
| 402 | BNF Enterprises | 146 |
| 11 | Barker & Williamson | 73 |
| 440 | Rex Bassett Electronics, Inc. | 140 |
| 428 | Bright Electronic Corp. | 73 |
| * | Britt's 2-Way Radio Service/AEA | 24 |
| * | Butternut Electronics | 46 |
| * | Butternut Electronics | 34 |
| 455 | Chaney Electronics | 139 |
| 13 | Clegg | 42 |
| 89 | Clutterfree Modular Consoles | 42, 89 |
| 484 | Colton Creators | 129 |
| 382 | Comm. Concepts, Inc. | 146 |
| 377 | Communications Electronics | 147 |
| 462 | Communications Electronics Specialties | 47 |
| 15 | Comm. Specialists | 10, 11 |
| 444 | Computer Plus | 143, 145 |
| * | Conley Radio Supply/AEA | 115 |
| * | Crown Micro Products | 79 |
| 70 | Cubic Comm. | 18 |
| 466 | dB + Enterprises | 143 |
| 330 | Debco Electronics | 82 |
| 411 | DGM Electronics, Inc. | 118 |
| 346 | Data Service | 145 |
| * | Digital Research Parts | 159 |
| 425 | Doppler Systems | 144 |
| 487 | Dow-Key | 128 |
| 453 | e.g.e., Inc. | 46 |
| 456 | Echo Comm. Division (Joseph's Ltd.) | 145 |
| 91 | ETCO Electronics | 83 |
| * | 80 Microcomputing | 109 |
| 480 | Electra | 78 |
| 447 | Electronic Hobby Innovations | 61 |
| 419 | Electronic Specialties | 141 |
| 400 | Engineering Consulting Service | 144 |
| 413 | Equipment Exchange | 143 |
| * | Erickson Comm. | 79 |
| 439 | Ben Franklin Electronics | 146 |
| 483 | Faxscan, Inc. | 129 |
| 23 | Flesher Corp. | 79 |
| 323 | Fox-Tango Corp. | 84 |
| 479 | GC Electronics | 80 |
| 482 | GRI Industries, Inc. | 128 |
| 27 | G.I.S.M.O. | 67 |
| * | Global Electronics | 146 |
| 393 | H. M. Goodwin | 144 |
| 25 | Germantown Amateur Supply | 87 |
| 417 | Gotham Antenna | 89 |
| * | Grove Enterprises | 125 |
| 345 | Hal Comm. | 43, 55 |
| 31 | Hal-Tronix | 82 |
| 30 | The Ham-Key Co. | 84 |
| 32 | Ham Radio Center | 63 |
| * | Ham Radio Outlet | 3 |
| 449 | The Ham Shack | 91 |
| 33 | Hamtronics, NY | 157 |
| 460 | Handi-Tek | 145 |
| 303 | Heath Co. | 15 |
| 34 | Henry Radio | Cov II |
| * | Henry Radio/AEA | 42 |
| 446 | Home Science Experiments | 146 |
| * | Hustler, Inc. | 33 |
| 316 | Hy-Gain Div. of Telex Comm., Inc. | 36, 39 |
| 466 | Hy-Gain Div. of Telex Comm., Inc. | 130 |
| * | ICOM | 9, 19, 35 |
| * | IRL | 29 |
| 35 | Info-Tech, Inc. | 116 |
| 414 | Inotek Engineering | 145 |
| 445 | Instant Software | 68, 69 |
| 36 | International Crystal Mfg. Co. | 77 |
| 409 | JDR Microdevices | 59 |
| 38 | Jameco Electronics | 161 |
| 39 | Jan Crystals | 140 |
| * | KLM Electronics | 25 |
| 470 | Kaigio Electronics | 139 |
| * | Kantronics | 77, 89 |
| * | KB Microcomputing | 109 |
| * | Kenwood | Cov IV, 7, 30 |
| 457 | Lewis Construction Co. | 141 |
| 451 | MCM Electronics | 21 |
| 434 | M&M Electronics | 138 |
| 47 | MFJ Enterprises | 57, 71, 73, 75 |
| 48 | MHz Electronics | 148-151 |
| 44 | Macrotronics | 118 |
| 45 | Madison Electronics | 75 |
| 49 | Micro Control Specialties | 138 |
| 313 | Micro Management Systems | 142 |
| 50 | Microcraft Corp. | 47 |
| 51 | Microlog Corp. | 51 |
| 52 | MidCom Electronics, Inc. | 56 |
| 488 | N.P.S., Inc. | 91 |
| 318 | National Comm. Group Co. | 85 |
| 412 | Nemal Electronics | 144 |
| * | Orbit Magazine | 141 |
| 452 | OrCom Distributors | 144 |
| 404 | P.B. Radio Service | 89 |
| * | P.C. Electronics | 67 |
| * | Palomar Engineers | 4 |
| * | Portland Radio Supply Co., Inc./AEA | 86 |
| 459 | QRO Engineering | 141 |
| 60 | Quest Electronics | 152 |
| 485 | RCA MicroComputer | 126 |
| 61 | Radio Amateur Callbook, Inc. | 116 |
| 454 | Radiokit | 139 |
| 381 | Radio Systems Techn. | 144 |
| 397 | Radio World | 83 |
| 62 | Ramsey Electronics | 119, 156 |
| 458 | Richcraft Engineering, Ltd. | 145 |
| 463 | Ricker Equipment, Inc. | 139 |
| 478 | Robot Research | 92 |
| 418 | Rolin Distributors | 116 |
| * | Ross Distributing/AEA | 83 |
| 376 | SMP | 140 |
| 65 | S-F Amateur Radio Services | 86 |
| 481 | Scientific Dimensions, Inc. | 130 |
| 64 | Semiconductors Surplus | 153-156 |
| * | 73 Magazine | 109-114, 117, 125 |
| * | Sherwood Engineering | 143 |
| 433 | Skytec | 146 |
| 367 | Slep Electronics | 143 |
| 360 | Soundpower | 140 |
| 309 | Spacecoast Research | 144 |
| * | Spectronics | 160 |
| 68 | Spectrum Comm. | 53 |
| 436 | Spectrum International | 45 |
| 455 | Star Trak Systems, Inc. | 144 |
| 403 | Stewart Quads | 86 |
| 430 | TEM Microwave Corp. | 144 |
| 476 | TET, USA | 99 |
| 316 | Telex Comm., Inc. | 38, 39 |
| 486 | Telex Comm., Inc. | 130 |
| * | Ten-Tec, Inc. | 13, 23 |
| 76 | Trac Electronics | 4 |
| 488 | Tri-Ex Tower | 129 |
| * | Trylon Mfg. Co. | 138 |
| 77 | Tufts Electronics | 146 |
| 37 | UPI Comm. Systems, Inc. | 138 |
| * | Universal Communications | 91 |
| 311 | Vanguard Labs | 145 |
| 373 | Van Gorden Engineering | 33 |
| 437 | Vani-Plate Co. | 86 |
| 464 | H. C. VanValzah Co. | 139 |
| 90 | VoCom Products Corp. | 47 |
| 79 | Wacom Products | 86 |
| 398 | Wawasee Electronics | 71, 75 |
| 80 | Western Electronics | 86 |
| 83 | Yaesu Electronics Corp. | Cov III |
| 396 | Z Associates | 145 |


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4. ☐ 31–40
5. ☐ 41–60
6. ☐ Over 60

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A. ☐ Yes
B. ☐ No

III. How long have you been a ham?
1. ☐ Less than one year
2. ☐ 1–5 years
3. ☐ 6–10 years
4. ☐ 11–25 years
5. ☐ Over 25 years

IV. What class license do you hold?
A. ☐ Novice
B. ☐ Technician
C. ☐ General
D. ☐ Advanced
E. ☐ Amateur Extra
F. ☐ Not licensed

V. Are you an ARRL member?
1. ☐ Yes
2. ☐ No

VI. If yes to question 5, please indicate membership.
A. ☐ Regular
B. ☐ Life

VII. How much time do you spend hamming?
1. ☐ Less than 10 hours per week
2. ☐ More than 10 hours per week

VIII. Is Amateur Radio your only hobby?
A. ☐ Yes
B. ☐ No

IX. Please list your other major interests.
1. ☐ Computers
2. ☐ Flying
3. ☐ Photography
4. ☐ Outdoor sports

X. Do you belong to an Amateur Radio Club?
A. ☐ Yes
B. ☐ No

XI. If yes to above, does your club have a Novice or newcomers class?
1. ☐ Yes
2. ☐ No

XII. Do you plan to build any equipment during the next year?
A. ☐ Yes
B. ☐ No

XIII. Did you build any equipment during the past year?
1. ☐ Yes
2. ☐ No

XIV. Do you own a microcomputer?
A. ☐ Yes
B. ☐ No

XV. Do you plan to purchase a microcomputer during the next year?
1. ☐ Yes
2. ☐ No

XVI. If you are not a subscriber please circle 500.

XVI. In general, I enjoy 73's columns (Looking West, RTTY Loop, etc.).
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2. ☐ No

XVII. If your answer to the previous question was yes, please rank the columns by order of preference (1 = favorite, 9 = least favorite).
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| 28 | 33 | 38 | 43 | 48 | 153 | 158 | 163 | 168 | 173 | 278 | 283 | 288 | 293 | 298 | 403 | 408 | 413 | 418 | 423 |
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| 54 | 59 | 64 | 69 | 74 | 179 | 184 | 189 | 194 | 199 | 304 | 309 | 314 | 319 | 324 | 429 | 434 | 439 | 444 | 449 |
| 55 | 60 | 65 | 70 | 75 | 180 | 185 | 190 | 195 | 200 | 305 | 310 | 315 | 320 | 325 | 430 | 435 | 440 | 445 | 450 |
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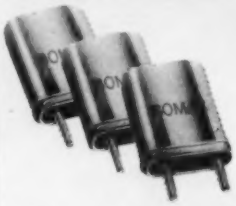

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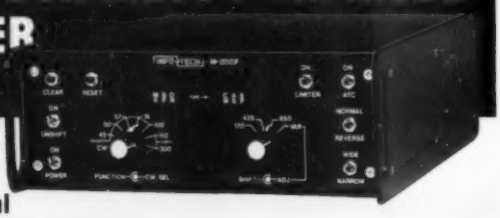

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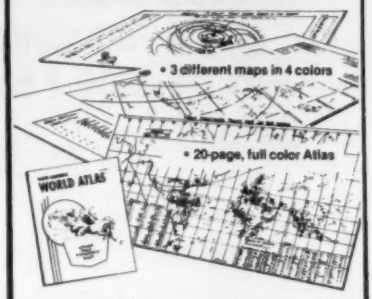


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318B6

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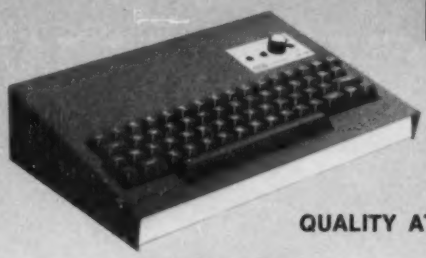

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A super sensitive amplifier which will pick up a pin drop at 15 feet! Great for monitoring baby's room or as general purpose amplifier. Full 2 W rms output, runs on 6 to 15 volts, uses 8-45 ohm speaker. Complete kit, BN-9 **$5.95**

### CPO-1

Runs on 3-12 Vdc 1 wall out, 1 KHZ good for CPO, Alarm, Audio Oscillator. Complete kit **$2.95**

### FM Wireless Mike Kit

Transmits up to 300' to any FM broadcast radio, uses any type of mike. Runs on 3 to 9V. Type FM-2 has added sensitive mike preamp stage.

FM-1 kit **$3.95** FM-2 kit **$4.95**

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An interesting kit, small mike picks up sounds and converts them to light. The louder the sound, the brighter the light. Includes mike, controls up to 300 W, runs on 110 VAC. Complete kit, WL-1 **$6.95**

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Produces LOUD ear shattering and attention getting siren like sound. Can supply up to 15 watts of obnoxious audio. Runs on 6-15 VDC

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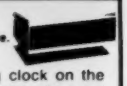

Try your hand at building the finest looking clock on the market. Its satin finish anodized aluminum case looks great anywhere, while six .4" LED digits provide a highly readable display. This is a complete kit, no extras needed, and it only takes 1-2 hours to assemble. Your choice of case colors: silver, gold, black (specify).

Clock kit, 12/24 hour, DC-5 **$24.95**
Clock with 10 min. ID timer, 12/24 hour, DC-10 **$29.95**
Alarm clock, 12 hour only, DC-8 **$29.95**
12V DC car clock, DC-7 **$29.95**

For wired and tested clocks add $10.00 to kit price.
SPECIFY 12 OR 24 HOUR FORMAT

## Car Clock

**The UN-KIT, only 5 solder connections**

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DC-9 **$34.95**

### Under Dash Car Clock

12/24 hour clock in a beautiful plastic case features 6 jumbo RED LEDS, high accuracy (.001%), easy 3 wire hookup, display blanks with ignition, and super instructions. Optional dimmer automatically adjusts display to ambient light level.

DC-11 clock with mtg. bracket **$27.95 kit**
DM-1 dimmer adapter **$2.50**
Add $10.00 Assy. and Test

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RE 6416, terminal card kit (add $60.00 for wired unit) **$180.95**
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Power Supply **$14.95**
RF Modulator kit **$7.95**

# PARTS PARADE

## IC SPECIALS

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| 324 | $1.50 |
| 380 | $1.50 |
| 555 | $ .45 |
| 556 | $1.00 |
| 565 | $1.00 |
| 566 | $1.00 |
| 567 | $1.25 |
| 741 | 10/$2.00 |
| 1458 | $ .50 |
| 3900 | $ .50 |
| 3914 | $2.95 |
| 8038 | $2.95 |

### TTL

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|---|---|
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| 7447 | $ .65 |
| 7475 | $ .50 |
| 7490 | $ .50 |
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| 10116 | $ 1.25 |
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| 7207A | $ 5.50 |
| 7216D | $21.00 |
| 7107C | $12.50 |
| 5314 | $ 2.95 |
| 5375AB/G | $ 2.95 |
| 7001 | $ 6.50 |

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| 4013 | .50 |
| 4046 | $1.85 |
| 4049 | .50 |
| 4059 | $9.00 |
| 4511 | $2.00 |
| 4518 | $1.35 |
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MAN 72/HP7730 .30"C.A **1.00**
HP 7881 .43"C.A **2.00**

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| 2N3906 PNP C+F | 15/$1.00 |
| 2N4403 PNP C+F | 15/$1.00 |
| 2N4410 NPN C+F | 15/$1.00 |
| 2N4916 FET C+F | 4/$1.00 |
| 2N5401 PNP C+F | 5/$1.00 |
| 2N6028 C+F | 4/$1.00 |
| 2N3771 NPN Silicon | $1.50 |
| 2N5179 UHF NPN | 3/$2.00 |
| Power Tab NPN 40W | 3/$1.00 |
| Power Tab PNP 40W | 3/$1.00 |
| MPF 102/2N5484 | $.50 |
| NPN 3904 Type T+R | 50/$2.50 |
| PNP 3906 Type T+R | 50/$2.50 |
| 2N3055 | $.80 |
| 2N2646 UJT | 3/$2.00 |

### Sockets

| | |
|---|---|
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| 14 Pin | 10/$2.00 |
| 16 Pin | 10/$2.00 |
| 24 Pin | 4/$2.00 |
| 28 Pin | 4/$2.00 |
| 40 Pin | 3/$2.00 |

### Diodes

| | |
|---|---|
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| 1N914 Type | 50/$1.00 |
| 1KV 2Amp | 8/$1.00 |
| 100V 1Amp | 15/$1.00 |

25 AMP 100V Bridge **$1.50 each**

Mini-Bridge 50V 1 AMP 2 for $1.00

### Resistor Ass't

Assortment of Popular values - ¼ watt. Cut lead for PC mounting, ½" center, ½" leads, bag of 300 or more. **$1.50**

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### Earphones

3" leads, 8 ohm, good for small tone speakers, alarm clocks, etc.
5 for $1.00

### Mini 8 ohm Speaker

Approx. 2"x" diam. Round type for radios, mike etc.
**3 for $2.00**

### Solid State Buzzers

small buzzer 450 Hz, 86 dB, sound output on 5-12 vdc at 10-30 mA, TTL compatible **$1.50**

### Slug Tuned Coils

Small 3/16" Hex Slugs turned coil, 3 turns. 10 for $1.00

### AC Outlet

Panel Mount with Leads
**4/$1.00**

### CAPACITORS

| TANTALUM Dipped Epoxy | ALUMINUM Electrolytic | DISK CERAMIC |
|---|---|---|
| 1.5 uF 25V 3/$1.00 | 1000 uF 16V Radial $.99 | .01 16V disk 20/$1.00 |
| 1.8 uF 25V 3/$1.00 | 500 uF 20V Axial $.50 | 1 16V 15/$1.00 |
| .22 uF 25V 3/$1.00 | 150 uF 16V Axial $/$1.00 | .001 16V 20/$1.00 |
| | 10 uF 15V Radial 10/$1.00 | 100 pF 20/$1.00 |
| | | .047 16V 20/$1.00 |

### DC-DC Converter

+5 vdc input prod. -9 vdc @ 30ma
+9 vdc produces -15 vdc @ 35ma **$1.25**

### Ceramic IF Filters

Mini ceramic filters 7 kHz B.W. 455 kHz $1.50 ea.

### Trimmer Caps

Sprague - 3-40 pf Stable Polypropylene **.50 ea.**

25K 20 Turn Trim Pot **$1.00**
1K 20 Turn Trim Pot **$ .50**

### Crystal Microphone

Small 1" diameter ¼" thick crystal mike cartridge **$.75**

### Mini RG-174 Coax

**10 ft. for $1.00**

### Coax Connector

Chassis mount BNC type **$1.00**

### 9 Volt Battery Clips

Nice quality clips **5 for $1.00**
¾" Rubber Grommets **10 for $1.00**

### Parts Bag

Asst. of chokes, disc caps, tant. resistors, transistors, diodes, MICA caps etc. sm. bag (100 pc) **$1.00** lg. bag (300 pc) **$2.50**

### Connectors

6 pin type gold contacts for mA-1003 car clock module price **.75 ea.**

### Leds

- your choice, please specify
Mini Red, Jumbo Red, High Intensity Red, Illuminator Red **8/$1**
Mini Yellow, Jumbo Yellow, Jumbo Green **6/$1**

### Varactors

Motorola MV 2209 30 PF Nominal cap 20-80 PF - Tunable range - **.50 each or 3/$1.00**

### Audio Prescaler

Make high resolution audio measurments, great for musical instruments tuning, PL tones, etc. Multiplies audio UP in frequency, selectable x10 or x100, gives .01 HZ resolution with 1 sec. gate time! High sensitivity of 25 mv, 1 meg input z and built-in filtering gives great performance. Runs on 9V battery, all CMOS.

PS-2 kit **$29.95**
PS-2 wired **$39.95**

### 600 MHz PRESCALER

Extend the range of your counter to 600 MHz. Works with all counters. Less than 150 mv sensitivity, specify - 10 or -100

Wired, tested, PS-1B **$59.95**
Kit, PS-1B **$44.95**

### 30 Watt 2 mtr PWR AMP

Simple Class C power amp features 8 times power gain. 1 W in for 8 out, 2 W in for 15 out, 4W in for 30 out. Max output of 35 W, incredible value, complete with all parts, less case and T-R relay.

PA-1, 30 W pwr amp kit **$22.95**
TR-1, RF sensed T-R relay kit **6.95**

MRF-238 transistor as used in PA-1 8-10db gain 150 mhz **$11.95**

### Power Supply Kit

Complete triple regulated power supply provides variable 6 to 18 volts at 200 ma and +5 at 1 Amp. Excellent load regulation, good filtering and small size. Less transformers, requires 6.3 V @ 1 A and 24 VCT.
Complete kit, PS-3LT **$6.95**

RF actuated relay senses RF (1W) and closes DPDT relay.
For RF sensed T-R relay
TR-1 Kit **$6.95**

### OP-AMP Special

BI-FET LF 13741 - Direct pin for pin 741 compatible, but 500,000 MEG input z, super low 50 pa input current, low power drain.

**50 for only $9.00** **10 for $2.00**

### Regulators

| | | | |
|---|---|---|---|
| 78MG | $1.25 | 7812 | $1.00 |
| 79MG | $1.25 | 7815 | $1.00 |
| 723 | $.50 | 7905 | $1.25 |
| 309K | $1.15 | 7912 | $1.25 |
| 7805 | $1.00 | 7915 | $1.25 |

### Shrink Tubing Nubs

Nice precut pces of shrink size: 1" x ½" shrink to ¼" Great for splices. **50/$1.00**

### Mini TO-92 Heat Sinks

Thermalloy Brand **5 for $1.00**
TO-220 Heat Sinks **3 for $1.00**

Opto Isolators - 4N28 type **$.50 ea.**
Opto Reflectors - Photo diode + LED **$1.00 ea.**

### Molex Pins

Molex already precut in length of 7. Perfect for 14 pin sockets. **20 strips for $1.00**

### CDS Photocells

Resistance varies with light, 250 ohms to over 3 meg **3 for $1.00**

See List of Advertisers on page 114

# DX

*Yuri Bianarovich VE3BMV*
*Box 292*
*Don Mills*
*Ontario M3C 2S2*
*Canada*

### BURMA UNLOCKED

What a surprise! After a few years of effort by various groups that were trying to activate XZ-land, all of a sudden there was a signal that got DXers excited and rushing to their rigs to work that #3 on the most-wanted list.

Station XZ5A started the operation on May 22 on 21270 with an opening to the east coast, and then worked some Europeans and Japan. Wow! No warning or announcement preceded this operation, except the unfilled "promises" of JA8BMK about his VU7-Andaman, 3V8, and other possible African operations. He was conspicuously absent from the bands and those looking for him were rewarded by this juicy catch.

As far as we were able to find out, the operation was carried out by JA8BMK and JA8BKM, plus one Burmese national. Operation was quite sporadic with apparently limited operating time (QRM to the chief of police's TV?) on SSB frequencies of 21270 and 14170 and some CW activity around 14007 and 21007. Propagation was what they would say was below normal, or el stinko—the signals were very weak.

On May 23, a number of west-coast stations had their chance of getting through. The east coast was handicapped by the absence of XZ5A when the bands were open to that area. There was a short (a few minutes) "window" around 1200Z on CW and a few SSB contacts were made in what sounded like, perhaps, a demonstration for the local government officials. Otherwise, thousands of DXers were scanning the bands hoping to get their chance to score. It was a battle of good antennas and persistence. You had to hear the signals before you could work them. Fortunately, there were no list "undertakers" and the operators at XZ were doing a good job under the circumstances.

Judging by the propagation conditions and limited operating time, there would be many unfulfilled hopes of getting this rare one. But there is one very positive sign: Burma finally might be unlocked and activated for future operations by nationals or expeditions. We are looking forward to some pictures from the expedition.

Congratulations to "Jin" Tishihiko Fukuta JA8BMK and company for this historic event. If you were fortunate to work XZ5A, QSL cards go to JA8BMK, PO Box 150, Asahikawa, Hokkaido 070, Japan.

### 10M BEACONS

| | | | |
|---|---|---|---|
| 28.175 | VE3TEN, Ottawa | 245 | A9XC |
| 200 | Common frequency | 247 | EA2OIZ |
| 205 | DL9IGI, Mt. Predigstuhl | 250 | VE7TEN |
| 207 | N4RD, Florida | 257 | DK0TE |
| 210 | 3B8MS | 275 | ZS6PW |
| 212 | ZD9GI | 277 | DL0AAB |
| 215 | GB3SX, Crowborough | 280 | YV5AYV |
| 220 | 5B4CY | 285 | VP8ADE, Adelaide Isle |
| 225 | VE8AA, Lake Contwoyto | 290 | VS6HK |
| 230 | ZL2MHF | 316 | ZS6DN |
| 235 | VP9BA | 888 | W6IRT |
| 237 | LA5TEN | 892 | WD9GOE |
| 238 | OA4CK | 992 | DL0NF |

### ABOLISH RS/RST SYSTEM?

I have read in other magazines about DL7DO's proposal to eliminate our "useless" RS and RST reporting, the reason being that everyone, especially in the contests, is giving out 59 or 599. Apparently it does not mean anything. What is the proposed solution? Use Q1 to Q3, where Q1 would mean: I don't hear you; Q2: I hear you; Q3 (I guess): I hear you too much—you just broke my speaker. This apparently would save a lot of time. Really? I think he is replacing something with "samething." He still has two digits to send, so there is no saving there. Only the *range* is reduced, from the scale of 9 down to 3. So we get *less*-accurate reports and from those who were giving out 59s, we now get Q3s.

So what do we gain? Nothing. We do not save time—we are still exchanging two digits. We eliminate more-accurate reporting for those who still use it. "S" has quite a well-defined meaning: It relates to the scale of about 5 dB per one S-unit.

Let's have a look at the contester who is giving out those "meaningless" 599 reports. The majority of contest stations run more than QRPp and a screwdriver for an antenna. When the bands are good, 80% of stations are coming in well over S9. So should we give out "599plus30-zerofour"? Or should we measure our S-meter and give out 58.7 reports? When you work stations at the rate of eight QSOs/minute, do you read your meter with a magnifying glass? Hell, no! You work them as fast as you can. If the station is weak or QRM is on the frequency, then the smart operator gives a 55 or 35 to tell the other guy that he is not that terribly strong and he should repeat his stuff twice.

Would the Q3 reports look any better in the contest log? Or should we not exchange the reports at all? What else is there to say to complete the contact? I'm quite surprised to see the serious magazines support this type of proposal by even printing it. We have more important things to worry about.

If one wants a comparison report on the antennas, the S-meter reading is meaningful. Then it is also good to know what type of rig the other guy is running because not all S-meters were created equally. Some are as generous as QRM and some were made in GM-land. It should be remembered that all this is relative because there are so many factors affecting the signal strength: antenna, propagation, QSB, balun, etc. It is not unusual, with bands being so hot lately, to have that thing sitting at the end of the scale.

So, let's stop worrying about the good and established things that we have and let's spend more time improving our skills and equipment!

### GEOMAGNETIC PREDICTIONS

There is a source of very useful geomagnetic activity predictions available from the Ottawa Magnetic Observatory. These can be obtained easily by phoning 1-(613)-824-5595. This service is available 24 hours a day and the latest forecast is updated every Tuesday and Friday.

During the April 11 through 14 period, the activity of the geomagnetic field was very high. The maximum of this magnetic storm was on April 13 at 0000 to 0900 GMT. The last time the magnetic field was disturbed to such an extent was during a nine-hour period in August, 1972. The aurora borealis was seen extensively across Canada and the USA and as far south as Arizona and the Gulf Coast.

There are three levels or magnitudes of geomagnetic activity used to describe the geomagnetic field: active, unsettled, and quiet, meaning, in terms of propagation, rotten, average, and good to excellent. This is especially useful when planning that expedition or contest operation.

Thank you for all the encouragement and letters. I would like to get the feeling of the makeup of the majority of this column's readers. I would like to tailor this column in such a way that we can satisfy the majority of readers. It is impossible to satisfy everyone. There are some of those who love lists and nets and there are also those who consider it to be in the "multi-operator" category. I will try to elaborate more on various techniques and perhaps the "ideal" situation in working DX without getting too many chasers upset.

I am in the process of setting up an Apple II computer with a word-processing program and some other sorting and filing programs. This should help in

setting up the files, DX info, and QSL manager lists.

We will try to get the fresh information on recent DXpeditions, including some photographs. If you have any pictures, especially color ones, please send them to VE3BMV, Box 292, Don Mills, Ontario M3C 2S2, Canada.

Good DX and see you all in the pileups!

### 10-METER BEACONS

The 10-meter band is very dependent on solar activity. During the peak of the sunspot cycle, the propagation conditions on the higher bands (10, 15, and 20 meters) are superb. The bands are open just about all the time. All parts of the world are coming through at the same time. It is not unusual to work all six continents within five minutes. When there is a disturbance, however, the band is as dead as a doornail.

Going back a few years, there was quite a bit of interest in studying propagation, especially on the 10m band. There were some openings, but many times everyone was just listening instead of calling. So, if all were just listening, nobody knew when the band was really open. A number of clubs and individuals started beacon stations, transmitting signals on certain frequencies in the 10m band. This proved to be very useful. Many are using the beacon signals to follow the openings to certain areas of the world. Most of them are using about 100 W and a vertical antenna. It is important to remember that not all of them are active all the time. So don't bet on it—the band could be open without a certain beacon being heard.

### DX NEWS

*C6A Bahamas* was on during the CQ WPX CW contest by K5IU, N5RM, and KC4XR. They were on between May 23 and June 2, operating all bands 10 through 80 on CW and SSB. QSL to their home callsigns.

*EA9-EC9 Ceuta* Novice net meets at 29000 almost daily, with a number of EC9 stations usually available. EA Novices now are allowed to operate in that segment of the 10m band.

*FG7BQ St. Barthelemy Island.* Charles is a public official on this island, which is situated between Puerto Rico and FG7 and is administered from FS7. He hangs around 28635 almost daily from 2100Z. QSL to Charles Querrand, St. Barthelemy City Hall, via Guadeloupe, F.W.I.

*Frank WB3KBZ/VP9 and Dotty Blaylock at their shack in Pembroke Parish, Bermuda. Frank is very active, especially on phone, operating on 15 and 20m and the YL SSB system.*

*FG0DDV/FS Saint Martin* by the members of North Jersey DX Association. Active on 10 through 80 in the usual DX splits plus General portions of US bands; also six-meter operation. QSL via W2QM.

*FR7AI/G Glorioso* was active until May 11. Showed up on various nets. QSL via FR7AI CBA (*Callbook* address).

*HB0 Liechtenstein* was activated by DA1WA/HB0, members of Wiesbaden ARC, on May 23 through 31, 6 through 160 CW, SSB, and RTTY. Worldwide QSL via DJ0LC; stateside QSL with an SASE to Stephen Hutchins, Box 4573, APO NY 09109.

*HS4ANK.* Joel is a recent arrival in Thailand and hopes to fill the void left by the departure of Fred Laun and George Collins. Daily schedules are: 14220 at 1200Z and 21300/350 or 28500 from 1600Z. QSL via Joel Dunlap, PO Box 38, Khonkain, Thailand.

*H44RW Solomon Islands.* Ron ZL1AMO was active mostly on CW on 10, 15, and 20 during his April to May visit. QSL to his home address.

*HZ1AB Saudi Arabia* is active with a number of operators around 14230 to 14240 at 1500, 1900, and 2200Z and on 7008 at 0430. QSL cards go via K8PYD.

*J5HTL Guinea Bissau.* Operator Hillar Loor is a resident and he assisted the J5AG DXpedition in their operation. He will be active on 10 and 15 SSB for about a year. J5AG operators SM3CXS, SM0AGD, and SM3DVN made over 20,000 contacts, with 10,000 on CW, during their nine-day stay. Their operation was hampered by only having electricity 14 hours a day. During the off-periods, they used the car batteries to run their IC-701 rigs.

*KA2AA Minami Torishima* was supposed to be on again during July. They tried to provide advance word about the operation and to concentrate on 40 and 80.

*KH1/KB6 Canton Island* was supposed to be activated by an American operator on and after May 20.

*KP4/A.* Two different groups have filed for the permission to reactivate *Desecheo* in the immediate future.

*LU1ZA South Orkneys,* Juan Carlos, joins the LU3ZY (S. Sandwich) schedule on occasional Tuesdays and Fridays at 0100Z. QSL via LU2CN. VP8ZR is near 14275 from 1930Z, QSL via G3KTJ.

*NN3SI Smithsonian Institution* oparated during the WPX CW contest within 33 kHz of the band edges. QSL to NN3SI, Smithsonian Institution, Washington DC 20560 USA (indicate

**DX INFORMATION**
**(Day and time in GMT)**

**Nets**

| Frequency | Time | When | Net |
|---|---|---|---|
| 21355 | 1800 | Dly | Afrikaner |
| 28750 | 1200 | Dly | DK2OC |
| 14220 | 0630 | Dly | VK2BKD, VK5MQ, VK9NS |
| 14250 | 1500 | Dly | W7PHO |
| 14225 | 2300 | Dly | W7PHO |
| 21345 | 2330 | Dly | W7PHO |
| 28510 | | Dly | 10m DX Net |
| 7080 | 0200 | Sun | 40m DX Net |
| 3795 | 0630 | Sat/Sun | 80m DX Net |
| 14265 | 0500 | Tue/Sat | Pacific DX Net |
| 14250 | 0500 | Fri | JY3ZH Arabian Knight |
| 28616 | 1600 | Sun | JY3ZH Arabian Knight |
| 21416 | 1530 | Sun | Foreign Service Net |
| 7260 | 1300 | Sat | E Coast Apple Net |
| 3790 | 0030 | Mon | VE3 Swap Shop |

**Bulletins**

| | | | |
|---|---|---|---|
| 14001 | 0200 | Mon | W6TI DX Bulletin |
| 14173 | 1600 | Sun | CANADX Net |
| 14220 | | Dly | DX Exchange Info |
| 1835 | 0130 | Fri | W1AW DX Bulletin |
| 3990 | 0430 | | SSB |
| 7290 | | | |
| 14290 | | | |
| 21390 | | | |
| 28590 | | | |
| 1835 | 0000 | Fri | CW 18 wpm |
| 3580 | 0300 | | |
| 7080 | | | |
| 14080 | | | |
| 21080 | | | |
| 28080 | | | |
| 3625 | 0100 | Fri | RTTY 60 wpm/170 Hz |
| 7095 | | | |
| 14095 | | | |
| 21095 | | | |
| 28095 | | | |

"WPX Contest" on the envelope).

*ST0 Southern Sudan.* LA1RR/ST0 expects to be there for two years and is usually around 28500/600 kHz from 1000Z. QSL via LA bureau.

*S2BTF Bangladesh* should have been activated by Peter HS1AMB on June 1-3 and continue on for several months.

*TL8CN Central African Republic* on CW daily: 7003/7004 from 0400Z and 21020/25 from 1300Z. Tony also runs SSB skeds on 28520/25 from about 1900Z. QSL via W5RU. TL8RC active on low ends of 40 and 80 from 0000Z. QSL via F6EZV.

*TY9ER Benin*, fired up as planned by DJ2BW and DL8DC, was to be on until May 13. QSL via DL8DC.

*UK1PAL Franz Josef Land* is expected to be active again. There was activity by the two YL operators, Rita and Natasha, using YL1P and EK1P callsigns. QSL via UP2BBM, Box 88, Moscow. The operators are with the USSR YL Arctic Expedition. Next stop is to be YL0B from Dickson Island.

*VK9 Melish Reef* is quite possible in the very near future. KB7NW's boat, *Banyandah*, will be refitted in Hawaii for the second leg of the operation by another group of operators. Hopefully, they will have a little bit better signal than the first group had from KH5 and KH5K.

*VQ9CCT Chagos* is no one other than VK9CCT and is active on 20m SSB.

*W8HMI* Frank Smith began his *African trip* on May 17. He was to start with EL and then 5Z, 9J2, 5H3, 6O, 5Z, and ST. He planned to operate mainly on 20m SSB. He was to return to the US by June 30. QSL to 6900 Conover Pl., Alexandria VA 22308.

*ZA Albania.* Very slim chance of getting on. DL7FT was in Dayton and showing his ZA license—but only the old one.

*ZD9 Tristan Da Cunha* was to be on after May 12 by ZD7AL and ZD7SE, transportation permitting.

*ZM7TT Tokelau.* Latest news was that Baruch has a license but not the landing permit; expected to get that one around May 20. Also, another group with VK9NS, VK2BJL, was to be on around May 15.

*3A0 Monaco* DXpedition by the Monaco DX Group (PA0SIM, PA2WLE, PA3AKP, PE1AMC, PE1AUX, and PE1CUG) was planning to be on July 10-20. Will be QRV on VHF, HF, and UHF bands, including OSCAR. No skeds, no lists! QSL via PA3ARM.

*3B8AE/3B9 Rodriguez* has been showing up on the F6EXV list on 21285 at 1630Z. QSL via Box 18, Rodriguez, via Mauritius. Op is Moussa.

*3D6 Swaziland* is activated by W6YB/3D6 for two years. He was heard around 21290 on long path. QSL via KA7IJA. Also, ZS6ANL/3D6 is active on 10m CW.

*VK4NIC/3X Guinea.* Ian is now back in Australia awaiting his next assignment, which he believes will be in Canada. Ian made a very favorable impression on the authorities in Guinea, opening the doors for future operations. PA0FAF expects to be stationed in 3X this summer and hopes to do some operating.

The ten most-wanted countries according to *The DX Bulletin* are: BY, VS9K, XZ, ZA, VU7L, VK Heard, 7O, XU, FB8W, and VU7A.

# AWARDS

Since its inception two years ago, *73 Magazine* has absorbed the escalating costs to maintain its world-renowned Awards Program. All expenses directly affecting the program have dramatically shot up in price! As of August 1, 1981, to offset these enormous costs, prices for *73* Awards will become $4.00 each and annual endorsements will become $2.00 each. These prices still will be below other competitive award sponsors in our hobby.

Award applicants are cautioned to be sure their remittance after August 1st reflects the new prices. Unfortunately, any applications received after this date which have the incorrect amount enclosed will have to be delayed while the applicant is notified of the discrepancy. This procedure will cost us both more time and money, so we plead with our readers to have the amount right the first time.

### FOREST COUNTY PA

A micro-expedition to Forest County, Pennsylvania, will be held on the 1st and 2nd of August, 1981.

The call will be WB3IQE/3 and the mode is CW only. Frequencies used will be 80, 40, and 15 meters. We will operate on two bands at a time, using the bottom 50 kilohertz of the bands. Exact frequencies and bands will depend on conditions at the time. We will certainly spend some time outside the Extra-only subbands. QSL to WB3IQE, RD1 Box 297, Brockway PA 15824. US stations send a stamped self-addressed envelope. Canadian stations send a self-addressed envelope and unused Canadian stamps good for letter to USA. DX stations include 1 IRC for QSL via ship, 2 IRCs for QSL via air.

### THE GREAT ESCAPE EXPEDITION

Members of the Lake County Amateur Radio Club are planning a DXpedition from the jail cell in Crown Point, Indiana, that John Dillinger fled in 1934 during his famous "wooden gun" escape, the final exploit of the notorious bank robber/killer before he was shot to death by FBI agents in front of the Biograph Theater in Chicago.

Dubbed "The Great Escape DXpedition," the operation is scheduled for 1800Z August 29 to 0300 August 30, and from 1400Z to 2300Z August 30.

Operators will be using the club callsign, W9LJ (Leaky Jail), on 14,300 SSB and 7,115 CW, plus or minus QRM.

Each contact will be confirmed, by a special QSL commemorating the escape, upon receipt of a card and a stamped, self-addressed envelope. Send in your QSL to Robert Wiberg WD9EZB, 534 E. 37th Ave., Lot 72, Hobart IN 46342.

The operating site will be the actual cell in which the desperado was held at the time of his breakout.

No longer used as a jail, the old building in which Dillinger was held for murdering an East Chicago policeman during a bank robbery has been restored as part of a commercial complex housing a museum, a restaurant, a ballroom, and a shopping mall.

### LITTLE GULL ISLAND

Radio Central ARC will sponsor an unusual 24-hour mini-expedition to Little Gull Island, running August 8th at 1600Z to August 9th at 1600Z. Callsign will be WA2UEC.

Little Gull Island is a small island in Long Island Sound about fifteen miles northeast of Orient Point. They will operate on the lower portions of the General bands, 10 to 80 meters, both CW and SSB. There will also be a Novice station operation. A photo QSL card will supply all information about the trip.

Please QSL via *Callbook* WA2UEC with SASE, the W2 Bureau, or IRCs. This will be the first of a series of mini-expeditions.

For more information, contact Frank Kiefer K2PWG, 1 Sherrill Lane, Port Jefferson Station NY 11776.

### PEND OREILLE

On August 27-30, the Pend Oreille Amateur Radio Club will be operating a special event station from the Pend Oreille County Fairgrounds in Cusick, Washington, during the fair. We will be on the air each day from 1600Z to 0500Z using the Newport High School Radio Club's call (WB7TBN). Frequencies will be (SSB) 14.340, 21.400, 28.700, 3945, (CW and RTTY) 3715, 28.090, 21.090, 14.080, and 3650. There will be a special commemorative QSL card available to all amateurs who contact our station and submit an SASE.

# SOCIAL EVENTS

*Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received two months prior to the month in which the event takes place. They should be sent directly to Editorial Offices, 73 Magazine, Pine Street, Peterborough NH 03458, Attn: Social Events.*

### WEST YELLOWSTONE MT
### JUL 31-AUG 2

The WIMU (WY-ID-MT-UT) Hamfest will be held from July 31-August 2, 1981, in West Yellowstone MT. Lodging and campgrounds are available. There will be product displays as well as activities for YLs and harmonics. Talk-in on 146.52, 3.920 or 1.250. For further information, contact "WIMU '81," c/o Les Belyea N7AIK, Box 327, Belgrade MT 59714.

### JACKSONVILLE FL
### AUG 1-2

The Greater Jacksonville Hamfest Association will hold the ninth annual Jacksonville Hamfest and Northern Florida Section ARRL Convention on August 1-2, 1981, at the Orange Park Kennel Club, located at the intersection of I-295 and US 17 just south of Jacksonville. Advance registration is $3.50 and registration at the door is $4.00. Swap tables are $12.00 per table for both days (no one-day tables). All events will be held indoors and will include a full slate of programs as well as meetings of several statewide and regional organizations. Door prizes will be awarded at both hourly and grand prize drawings. Plenty of free parking will be available. The headquarters hotel is the Best Western First National Inn just across from the hamfest site on US 17. Special hamfest rates will be available. Talk-in on 146.16/.76 and 146.07/.67. For advance registration, hotel rates, or more information, contact Robert J. Cutting W2KGI, 1249 Cape Charles Avenue, Atlantic Beach FL 32233, or Andy Burton, Jr., WA4TUB, 5101 Younis Road, Jacksonville FL 32218. For swap tables, contact WA4TUB at the address listed above.

### ESCANABA MI
### AUG 1-2

The Delta County Repeater Association will hold the 33rd annual Upper Peninsula hamfest on August 1-2, 1981, at the Flat Rock Township Hall, Escanaba MI. Registration is $2.00. The many activities will include a DX forum, an ARPSC workshop, a satellite-TV seminar, net meetings, and a swap and shop. There will be prizes and a banquet on Saturday evening. For more information, contact Aileen Gagnon WA8DHB, co-chairman of the prize committee, Kipling Loc., Mtd. Rte., Gladstone MI 49837.

### LEVELLAND TX
### AUG 2

The Hockley County Amateur Radio Club and the Northwest Texas Emergency Net will sponsor their 16th annual picnic and swapfest on Sunday, August 2, 1981, beginning at 8:00 am at the city park in Levelland TX. This event is for the entire family. Bring your own picnic basket for lunch at 12:30. A $3.00 registration is requested. There will be swapping all day, with tables provided. Talk-in on .28/.88 (WR5AFX).

### MOBERLY MO
### AUG 2

The third annual North Central Missouri Hamfest will be held on Sunday, August 2, 1981, at the air-conditioned Municipal Auditorium, 201 West Rollins, Moberly MO. Doors open at 9:00 am. Tickets are $1.50 in advance and $2.00 at the door. Features include commercial dealers, a flea market (no charge for tables), an ARRL display, exhibits, prizes, women's programs, a special forum with Bob Heil K9EID on CB-to-10-meter conversions, and a buffet lunch. Drinks and hot dogs will be available all day. Talk-in on 147.69/.09, 146.52, and 3963. For more information, contact Charles Coy WB0ENV, 601 McKinley, Moberly MO 65270.

### ANGOLA IN
### AUG 2

The Steuben County Radio Amateurs will hold their 23rd annual FM Picnic and Hamfest on Sunday, August 2, 1981, at Crooked Lake, Angola IN. Admission is $2.50. There will be prizes, picnic-style BBQ chicken, inside tables for exhibitors and vendors, and overnight camping (with a fee charged by the county park). Talk-in on 146.52 and 147.81/.21.

### BELVIDERE IL
### AUG 2

The annual Big Thunder ARC Hamfest will be held on August 2, 1981, at the Boone County Fairgrounds, Highway 76. Advance tickets are $2.00. Indoor tables are available at a nominal cost and there will be acres of outdoor space available free. Camping is permitted. For advance tickets, send an SASE and check to Bob Anderson K9DCG, 910 W. Locust Street, Belvidere IL 61008.

### COLBY KS
### AUG 2

The first Northwest Kansas Amateur Radio Swap Meet will be held on Sunday, August 2, 1981, beginning at 9:00 am at the Community Building, Colby KS. Admission is $1.00 and tables are $1.00 each (same for dealers). An auction will be held at 2:00 pm. Other features will include a TVRO demonstration, activities for the ladies, and old-fashioned informal swapping, selling, and visiting. Lunch will be available. Talk-in on 146.22/.82 and .52/.52. For more information, contact WA0GBN or KA0FBQ.

### WINCHESTER VA
### AUG 2

The Shenandoah Valley Amateur Radio Club will celebrate "31 years without interruption" at its annual hamfest on Sunday, August 2, 1981, at the Clark County Ruritan Fairgrounds in Berryville VA, 10 miles east of Winchester on Route 7. Gates open at 7:00 am for exhibitors and tailgaters, for whom fees will be the same as last year. Registration is $3.00, and wives and young children will be admitted at no charge. Hourly prize drawings; major prizes will include three transceivers. Breakfast and Ruritan's famous barbequed chicken dinners will be available. Talk-in on 146.22/.82, 147.90/.30, and 146.52/.52. For further information, contact Joann Aaron WB2CMV, PO Box 139, Winchester VA 22601.

### POMONA CA
### AUG 8

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 8, 1981, from 9:00 am to 3:00 pm at the Los Angeles County Fairgrounds (Thummer's Patio), Pomona CA. There is no admission charge. Bring your own picnic lunch. Refreshments will be available. Featured at a noon raffle will be grand prizes of a Quasar 10" TV and a Tempo S-1 handie-talkie. The drawing donation is $1.00 and the winner need not be present. Talk-in on 146.34/.94. For additional information, write TCARA, PO Box 142, Pomona CA 91767.

### BEAVERTON OR
### AUG 8-9

The Willamette Valley DX Club will hold the 1981 Northwest DX Convention on August 8-9, 1981, at The Greenwood Inn in Beaverton OR, just west of Portland. The grand prize will be an Icom-730. Speakers will include Carl WA4ZNH and Martha WB4FVU. For more information, write PO Box 555, Portland OR 97207.

### BURLINGTON VT
### AUG 8-9

The Burlington Amateur Radio Club will hold its annual International Hamfest on August 8-9, 1981, at the Old Lantern Campground, Charlotte VT (14 miles south of Burlington, just off Rte. 7). Admission is $4.00 (US funds). Planned events include a flea market, commercial exhibits, a CW contest, a tower-raising contest, an HT transmitter hunt, and the traditional Canadian-American tug-of-war. Talk-in on .34/.94. For more information, contact Hap Preston W1VSA, PO Box 312, Burlington VT 05402. For campground reservations, call Old Lantern Campground at (802)-425-2120.

### LEXINGTON KY
### AUG 9

The Bluegrass Amateur Radio

Society will hold its annual Central Kentucky Bluegrass Hamfest on Sunday, August 9, 1981, from 8:00 am until 4:00 pm EDT at a new location, the Tates Creek Junior High School, Centre Parkway, Lexington KY. Tickets are $3.50 in advance and $4.00 at the door. Outdoor flea market space is free with admission. There will be technical forums, indoor exhibits, door prizes, a grand prize of a two-meter all-mode transceiver, a ladies' program, a protected paved flea market area, and free parking. Talk-in on 146.16/.76. For more information, please contact Ernie Cohen K4DHN, 3379 Sutherland Drive, Lexington KY 40502

**WILLOW SPRINGS IL**
**AUG 9**

The Hamfesters Radio Club will hold its 47th annual hamfest on Sunday, August 9, 1981, at Sante Fe Park, 91st and Wolf Road, Willow Springs IL.

**ST. CLOUD MN**
**AUG 9**

The St. Cloud Amateur Radio Club Hamfest will be held on August 9, 1981, from 8:00 am to 4:00 pm at the Whitney Senior Center in St. Cloud MN. Features will include a swapfest, prizes, and refreshments. Talk-in on 146.34/.94. For further information, contact Mike Lynch KAØHQS, 2115 1st Street South, St. Cloud MN 56301, or phone (612)-251-2297.

**MONTGOMERYVILLE PA**
**AUG 9**

The Mid-Atlantic Amateur Radio Club will hold its annual J.B.M. Hamfest on Sunday, August 9, 1981, from 9:00 am to 4:00 pm, rain or shine, at the Budco 309 Drive-In Theater, ¼ mile north of the intersection of Rtes. 63 and 309, Montgomeryville PA (6 miles north of the Fort Washington interchange of the Pennsylvania Turnpike). Admission is $2.50 with $1.00 additional for the first tailgate space and 75¢ for each additional space. Tailgate setup begins at 8:00 am. Featured will be an Alternate Energy Fair which will include exhibitions of various energy resources, as well as door prizes and a flea market for both the hamfest and the Alternate Energy Fair. Refreshments will be available. Talk-in on 147.66/.06 (WB3JOE) or 146.52. For further information, call Don Schuenemann WB3AYT at (215)-822-9076.

**AUSTIN TX**
**AUG 14-16**

The Austin Amateur Radio Club and the Austin Repeater Organization will hold the ARRL-approved VHF '81, a combination state convention of the Texas VHF FM Society and the second annual Super Central Texas Swapfest, on August 14-16, 1981, at the Hilton Inn, Austin TX. Registration is $5.00 in advance (August 1st deadline) or $6.00 at the door. Tickets are good for technical sessions, seminars, the swapfest, and more (all indoors and air-conditioned). Other features include the hidden transmitter hunt, the Saturday night boat ride, and the Texas barbecue dinner, prizes, an ARRL forum, and dealers. Talk-in on 146.19/.79. For additional information, contact VHF '81, PO Box 13473, Capitol Station, Austin TX 78711.

**OMAHA NE**
**AUG 14-16**

Satellite Television Technology will hold a Satellite Private Terminal Seminar on August 14-16, 1981, in Omaha NE. Included will be more than 50 exhibit booths with low-cost home satellite TV reception terminal equipment and systems. The seminar program will teach how to make this equipment function at peak performance at all times. Three lecture halls will be set up with test equipment and operating portions of systems where attendees can meet with experts and obtain information about their own installations. For more details on the program and registration, contact SPTS '81 Omaha, PO Box G, Arcadia OK 73007, or phone Rick Schneringer at (405)-396-2574.

**OAKLAND NJ**
**AUG 15**

The Ramapo Mountain Amateur Radio Club (WA2SNA) will hold its 5th annual flea market on August 15, 1981, at the American Legion Hall, 65 Oak Street, Oakland NJ, only 20 miles from the GW Bridge. Admission is $1.00; YLs and harmonics will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Door prizes will be awarded and refreshments will be available. Talk-in on 147.49/146.49 and 146.52. For more information, contact Walt Zierenberg WD2AAI, 344 Union Avenue, Bloomingdale NJ 07403, or phone (201)-838-7565.

**HUNTSVILLE AL**
**AUG 15-16**

The Huntsville Hamfest (formerly the North Alabama Hamfest) will be held on Saturday and Sunday, August 15-16, 1981, at the Von Braun Civic Center in Huntsville AL. There is no admission charge. There will be prizes, exhibits, forums, an air-conditioned indoor flea market, and ladies' activities. Tours of the Alabama Space & Rocket Center are available for the family. A limited number of camping sites with hookups are available at the VBCC on a first-come, first-served basis. Flea market tables are available for $3.00 per day. Talk-in on 3.965 and .34/.94. For more information write, Huntsville Hamfest, PO Box 4563, Huntsville AL 35802.

**TACOMA WA**
**AUG 15-16**

The Radio Club of Tacoma will hold its annual Hamfair on August 15-16, 1981, at Pacific Lutheran University in Tacoma, WA. Featured will be many outstanding technical seminars, games and contests for all members of the family, a large flea market and commercial display area, dinner and after-dinner entertainment, and valuable door prizes. Trailer parking and lodging are available. For more details, contact Eva Anderson WB7QNS, 517 Berkeley Avenue West, Tacoma WA 98466, or phone (206)-564-8347.

**WARREN OH**
**AUG 16**

The Warren Amateur Radio Association will hold its 24th hamfest on August 16, 1981, at the Kent State University branch, Warren OH. There will be six major prizes. For more information, write PO Box 809, Warren OH 44482.

**HAMDEN CT**
**AUG 16**

The 5th annual WELI/Hamden Radio Club Flea Market will be held on Sunday, August 16, 1981, from 9:00 am to 5:00 pm at Radio Towers Park, Benham Street, Hamden CT. General admission is $1.00 and dealer's charge is $5.00 per space with room for one car. For further information or reservations, write Hamden Radio Club, 199 Wayland Street, Hamden CT 06518, or call (203)-288-3765 after 5:00 pm.

**LAFAYETTE IN**
**AUG 16**

The Tippecanoe Amateur Radio Association will hold its 12th annual hamfest on Sunday, August 16, 1981, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. The grounds will open at 7:00 am and advance tickets are $3.00. Features will include a large flea market, manufacturers, dealers, fun, and prizes. Talk-in on 146.13/.73 or 146.52. For advance tickets and additional information, send a check (payable to Lafayette Hamfest) to J. B. VanSickle K9KRE, RR 1, Box 63, Westpoint IN 47992.

**WILMINGTON DE**
**AUG 16**

The Sixth Annual New Delmarva Hamfest will be held on Sunday, August 16, 1981, at Gloryland Park, Bear DE (5 miles south of Wilmington), from 8:00 am to 4:00 pm. Admission is $2.25 in advance, $2.75 at the gate, and YL and jr. ops will be admitted free. Tailgating or table space under the pavilion is $3.50. There will be a limited supply of free tables, or bring your own. Refreshments will be available. First prize of an Icom IC-2A and many other prizes will be awarded. Talk-in on .52 and .13/.73. For map, info, or advance tickets, send an SASE to Stephen J. Momot K3HBP, 14 Balsam Road, Wilmington DE 19804. Make checks payable to Delmarva Hamfest, Inc.

**FARMINGTON ME**
**AUG 22**

The Sandy River Amateur Radio Club/Somerset Amateur Radio Association Hamfest will be held on Saturday, August 22, 1981, at the Farmington Fairgrounds, Farmington ME. Admission is a $1.00 donation. Free camping will be available from 5:00 pm Friday until Sunday morning. Light refreshments also will be available. Talk-in on 146.37/.97, 147.615/.015, or 146.52/.52. For additional information, send an SASE to Charles Stenger W1HTG, Box 111, East Dixfield ME 04227.

### MARYSVILLE OH
### AUG 22-23

The Union County Amateur Radio Club will hold its fifth annual Hamfest-81 on August 22-23, 1981, at the Union County Fairgrounds, Marysville (near Columbus) OH. Gates open until Sunday at 4:00 pm. Admission is $2.00 in advance and $3.00 at the gate. Children will be admitted free. Featured on Saturday night will be movies, popcorn, round and square dancing to a live band, and overnight camping with hookups, all free. Food will be available all night with a big country breakfast starting at 3:00 am. On Sunday there will be forums, door prizes, and meetings. There will be no extra charge for sellers at the flea market which opens at 4:00 pm on Saturday and 6:00 am on Sunday. Talk-in on 147.99/.39 and .52. For more information, write Union County Amateur Radio Club, 13613 US 36, Marysville OH 43040.

### ST. CHARLES IL
### AUG 23

The Fox River Radio League will host the 1981 Illinois State ARRL Convention in conjunction with its annual hamfest, all to be held on Sunday, August 23, 1981, from 8:00 am to 4:00 pm at the Kane County Fairgrounds in St. Charles IL. The Convention program features forums on antennas, DX, and ARRL operations. There will also be several contests and demonstrations of amateur radio communications modes. Advance tickets are $1.50 and $2.00 at the gate. Talk-in on 146.940. For advanced tickets, send an SASE to Jerry Frieders W9ZGP, 1501 Molitor Road, Aurora IL 60505. Commercial exhibitors should contact Mike Pittard KA9EVT at (312)-896-7383.

### WENTZVILLE MO
### AUG 23

The Saint Charles Amateur Radio Club, Inc., will hold Hamfest '81 on August 23, 1981, at the Wentzville Community Center, West Main Street, Wentzville MO. Advance tickets are $1.00 each or 4 for $3.00; at the door tickets are $1.50 each or 4 for $5.00. Parking is $1.00 per car (no camping on hamfest site). Featured will be a reserved flea market for amateurs, a free general flea market area, free bingo, a cake walk, refreshments, and prizes (including a first prize of a Kenwood TS-130S transceiver). Free doughnuts and coffee will be available to the early birds. Talk-in on .07/.67 and .52. For information on motels, tickets, displays, prize lists, camping, etc., write Bill Graham WB0ZEH, 215 Bermuda, O'Fallon MO 63366.

### BLUEFIELD WV
### AUG 23

The East River Amateur Radio Club, Inc., will hold the Bluefield Hamfest '81 on Sunday, August 23, 1981, at the Brushfork Armory/Civic Center located on US 52, one mile north of Bluefield WV. Admission is $2.00 in advance and $3.00 at the gate, and includes a prize ticket. Tailgaters are $2.00 each and tables are $5.00 each (3 or more are $4.00 each). There will be food, dealers, a flea market, forums, and entertainment. Talk-in on .89/.49 and .52/.52. For more information, write Bluefield Hamfest '81, 2113 Hemlock Hill, Bluefield WV 24701.

### DES MOINES IA
### AUG 23

The Iowa 75-Meter Net will hold a picnic and swapfest on Sunday, August 23, 1981, at Ewing Park in southeast Des Moines IA. A potluck meal will start at 12:00 noon and a program (including prizes) will follow. Talk-in on .34/.94. For further information, contact Lovelle Pedersen WB0JFF, Net Secretary, 2327 W. Reinbeck Road, Hudson IA 50643.

### TIOGA COUNTY PA
### AUG 29

The Tioga County Amateur Radio Club will hold its 5th annual hamfest on Saturday, August 29, 1981, from 8:00 am to 4:00 pm, at the Tioga County Fairgrounds just off Rte. 6, between Wellsboro and Mansfield PA. There will be a free outdoor flea market and inside space will be available. Registration is $3.00. Features will include prizes, demonstrations, and food. Pennsylvania's Grand Canyon is nearby. Talk-in on 146.19/.79 and .52. For more information, write PO Box 56, Mansfield PA 16933.

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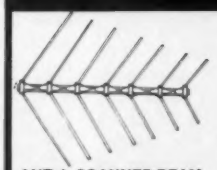

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### SEWELL NJ
### AUG 30

The Gloucester County Amateur Radio Club will hold the GCARC Hamfest on August 30, 1981, from 8:00 am to 3:00 pm (7:00 am for tailgaters and dealers) at the Gloucester County College, Tanyard Road, Sewell NJ. Admission is $2.00 in advance and $2.50 at the door. Tailgaters' and dealers' charge is $6.00 (which includes one free admission). Refreshments and free parking will be available. Features will include seminars, prizes, contests, and speakers Dale Smith, from the ARRL, and Miles (Brownie) Brown W2PAU, an RCA antenna expert. FCC exams will be given from Tech through Advanced. Talk-in on 146.52 and 147.78/.18. For more information and reservations, send an SASE to GCARC Hamfest Committee, PO Box 370, Pitman NJ 08071, or phone (609)-456-0500 or (609)-338-4841 days or (609)-629-2064 evenings.

### LA PORTE IN
### AUG 30

The La Porte and Michigan City Amateur Radio Clubs will hold their annual La Porte County Hamfest on Sunday, August 30, 1981, rain or shine, at the County Fairgrounds on Highway 2, west of La Porte IN (50 miles SE of Chicago). There will be an outdoor paved flea market area, indoor tables at $1.00 each, a satellite TV demonstration, and overnight trailer parking for early birds. Advance tickets are $2.00. For reservations or information, send an SASE to PO Box 30, La Porte IN 46350.

### GEORGETOWN IL
### SEP 5-6

The Illiana Repeater System will hold the 12th annual Danville Area Hamfest on September 5-6, 1981, at the Georgetown Fairgrounds, Georgetown IL. The gates will open at 6:30 am. Tickets are $1.50 in advance and $2.00 at the gate. There will be a flea market, forums, family entertainment, many prizes (including a Santec synthesized hand-held), and free parking. Talk-in on 146.22/.82 and 146.52. For more information or advance tickets, contact Lowell Wells WD9AFG, Hamfest Chairman, RR 3, Box 215, Danville IL 61832, or phone (217)-759-7560.

### BLOOMINGTON IN
### SEP 6

The Bloomington Area amateur radio hams will hold their 4th annual Hoosier Backyard Hamfest on Sunday, September 6, 1981, rain or shine, from 7:00 am until 5:00 pm at 2335 Vernal Pike, Bloomington IN. Admission is $2.00. Features will include door prizes, a swap 'n shop, vendors, free setups, balloon rides, a 50/50 drawing, refreshments, ATV demonstrations, and an Aptron ATV converter as the grand prize. Talk-in on 147.78/.18, 146.04/.64, or 223.26/224.86. For further information, contact Bob Myers K9KTH at 2335 Vernal Pike, Bloomington IN, or call (812)-332-2433.

### AUGUSTA NJ
### SEP 12

The Sussex County Amateur Radio Club will hold its third annual SCARC '81 hamfest on Saturday, September 12, 1981, from 8:00 am to 3:00 pm at the Sussex County Farm and Horse Show grounds, Plains Road off Rte. 206, Augusta NJ. Pre-registration for outdoor flea-market sellers is $4.00; at the gate, $5.00. Pre-registration for indoor flea-market sellers is $5.00; at the gate, $6.00. Other registration is $2.00. There will be door prizes and plenty of free parking. Talk-in on 147.90/.30 and 146.52. For additional information or pre-registration, write Sussex County Amateur Radio Club, PO Box 11, Newton NJ 07860, or Lloyd Buchholtz WA2LHX, 10 Black Oak Drive, Vernon NJ 07462.

### GAITHERSBURG MD
### SEP 13

The Foundation for Amateur Radio, with the support of more than 50 affiliated clubs in the greater Washington-Baltimore areas, will hold the Gaithersburg Hamfest on Sunday, September 13, at the Montgomery County Fairgrounds, Gaithersburg MD. Gates open at 8:00 am; setup and talk-in begin at 6:00 am. Events featured include commercial exhibits, indoor flea market, tailgating, and ladies' activities. Admission is $3.00 at the gate; children under 12 admitted free. For further information, write Foundation for Amateur Radio, PO Box 523, Bowie MD 20715, or contact Stuart Meyer W2GHK, hamfest chairman, 2417 Newton Street, Vienna VA 22180; (703)-525-6286 (office) or 281-3806 (home).

### KEW GARDENS NY
### SEP 13

The Hall of Science Amateur Radio Club will hold its annual electronic hamfest on Sunday, September 13, 1981, from 9:00 am to 4:00 pm, at the municipal parking lot, 80-25 126th street, Kew Gardens, Queens NY. Featured will be free parking, door prizes, refreshments, a raffle, and an auction. Sellers' spaces are $3.00; buyers' admission is $1.00. Talk-in on .52. For additional info, contact Tom Doyle KA2DTB at (212)-351-6354 (days).

### PORT JEFFERSON LI NY
### SEP 13

The Suffolk County Radio Club will hold its ARRL-supported 4th annual Electronic Flea Market on Sunday, September 13, 1981, with a rain date of September 20, 1981. The site is the Odd Fellows Hall, Jane Boulevard, Port Jefferson LI NY. Walk-ins will be $1.50 and sellers will be $3.00. There will not be any charge for XYLs and harmonics of attending hams. Gates will open at 7:00 am. Bargains, prizes, food, and hamship will be available. Talk-in on .52, .94, and 223.50. For more information, contact Floyd Davis at (516)-234-9376.

### TIVERTON RI
### SEP 13

The Bristol County Amateur Radio Association will hold its annual indoor/outdoor flea market on September 13, 1981, from 12:00 noon to 4:00 pm at the VFW hall in Tiverton RI. Admission is $1.00 and flea market spaces are $6.50. Door prizes will be drawn. Talk-in on 147.63/.03 and .52. For maps, send an SASE to Ann M. Carro KA1DNB, 652 Old Colony Terrace, Tiverton RI 02878.

### FINDLAY OH
### SEP 13

The Findlay Hamfest will be held on Sunday, September 13, 1981, at the Hancock Recreational Center, just east of I-75 exit 161, on the north edge of Findlay, 40 miles south of Toledo. Tickets are $2.00 in advance and $2.50 at the gate. Tables are $2.50 per half. Setups on Saturday are from 5:00 pm to 9:00 pm and on Sunday at 6:00 am. Major prizes include a deluxe low-band rig, two hand-helds, a memory keyer, and more. For tickets, information, or reservations, send an SASE to PO Box 587, Findlay OH 45840

### HAMBURG NY
### SEP 18

The 10th annual Ham-O-Rama '81 will be held on Friday and Saturday, September 18-19, 1981, from 7:00 am to 5:00 pm at the Erie County Fairgrounds near Buffalo NY. Advance tickets (deadline: September 4th) are $3.00 and tickets at the gate will be $4.00. Children under 12 will be admitted free. The outside flea market is $2.00 per space and the inside flea market is $7.00 per space. Features will include new equipment displays, computers, technical programs, ladies' programs, and valuable awards. Talk-in on 146.31/.91. For advance tickets, send an SASE to David G. Baco WA2TVT, 130 Vegola Avenue, Cheektowaga NY 14225.

### GRAND RAPIDS MI
### SEP 19

The Grand Rapids Amateur Radio Association will hold its annual Swap and Shop on Saturday, September 19, at the fairgrounds in Hudsonville MI. There will be door prizes, dealers, an indoor swap area, and an outdoor trunk swap area. Gates will open at 8:00 am for both swappers and the public. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

### GRAYSLAKE IL
### SEP 19-20

The Chicago FM Club will hold Radio Expo '81 on September 19-20, 1981, at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL, about 30 minutes north of Chicago and 45 minutes south of Milwaukee. The flea market is open from 6:00 am to to 6:00 pm and the exhibits are open from 9:00 am to 9:00 pm on both days, rain or shine. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. Features include seminars, a ladies' program, prizes, free parking, a new camping site with hookups, commercial ham and computer displays, and full food services. Bring your own tables and chairs to the indoor and outdoor flea market (or even tailgate).

Space is free with a gate ticket. Talk-in on 146.16/.76, 146.52, and 222.5/224.10. For more information, call (312)-BST-EXPO. For advance tickets, send a #10 SASE to Box 1532, Evanston IL 60204.

### PEORIA IL
### SEP 19-20

The Peoria Area Amateur Radio Club will hold the Peoria Superfest '81 on Saturday and Sunday, September 19-20, 1981, at the Exposition Gardens, W. Northmoor Road, Peoria IL. Gate opens at 6:00 am; commercial building at 9:00 am. Activities include forums, amateur and computer product displays, a flea market, ladies' programs, and children's activities. Full camping facilities are available. Talk-in on 146.16/.76. For more information, contact Charles W. Kuhn WD9EGW, 7005 N. Tobi Lane, Peoria IL 61614.

### NEWTOWN CT
### SEP 20

The Candlewood Amateur Radio Association's flea market and auction will be held on Sunday, September 20, at the Essex House, Rte. 6 in Newtown CT, Exit 8 off I-84, from 10:00 am to 4:00 pm. Admission is $1.00; tables are $6.00. Activities include door prizes, a raffle, dealers, and a magic show for the kids. Talk-in on 147.72/.12. For more information, contact George WB2THN at (914)-533-2758 or Ken KA1GDS at (203)-744-6953.

### ROSS OH
### SEP 20

The Greater Cincinnati Amateur Radio Association, Inc., will hold its annual Cincinnati Hamfest on Sunday, September 20, 1981, at Stricker's Grove on Ohio State Rte. 128, one mile west of Ross (Venice) OH. There will be exhibits, 10 major prizes, food, and refreshments available. Activities include a flea market with radio-related products only, a transmitter hunt, entertainment, and an air show. Admission is $4.00. For further information, contact Lillian B. Abbott K8CKI, 1424 Main Street, Cincinnati OH 45210.

### MT. CLEMENS MI
### SEP 20

The L'Anse Creuse Amateur Radio Club will hold its 9th annual Swap and Shop on Sunday, September 20, 1981, from 9:00 am to 3:00 pm at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 east-bound to the Metropolitan Parkway exit, then the Metropolitan Parkway to Crocker, go left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $2.00 at the door or $1.00 in advance. There will be FCC representatives and a test equipment table. There will be plenty of food and parking, plus hourly prize drawings. Prizes include a first prize of $250, a second prize of $100, and third prize of $50. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Mike Corcoran N8CEN, 650 Chippewa, Mt. Clemens MI 48043.

### AUGUSTA GA
### SEP 20

The Augusta Amateur Radio Club will hold its annual hamfest on Sunday, September 20, at the Julian Smith Casino in Augusta GA. Tickets are $1.00 each; tailgaters, $3.00. Open at 9:00 am, everything is indoors except the flea market. There will be door prizes, a grand prize drawing at 3:00 pm, bingo, and refreshments. Talk-in on 146.34/.94. For more information, contact Diane Miller WB4YHT at (404)-860-3700.

### ELMIRA NY
### SEP 26

The Elmira Amateur Radio Association will hold the sixth annual Elmira International Hamfest on Saturday, September 26, 1981, at the Chemung County Fairgrounds. Gates will open at 8:00 am. Tickets are $2.00 in advance and $3.00 at the gate. Features will include a free flea market, tech talks, and dealer displays. Food will be available and door prizes will be awarded. The grand prize will be three items: an Icom IC-255A, an Icom IC-2AT, and an Avanti mobile antenna. A shuttle service from the Chemung County Airport will be provided for fly-ins who bring an HT. Talk-in on 147.96/.36, 146.10/.70, and 146.52/.52. For more information and/or tickets, contact John Breese WA2FJM, 340 West Avenue, Horseheads NY 14845.

### LOUISVILLE KY
### SEP 26-27

The eleventh annual Greater Louisville Hamfest and the 1981 Great Lakes Division Convention will be held on September 26-27, 1981, at the East Hall of the Kentucky Fair and Exposition Center in Louisville KY. There will be a large indoor exhibitors' area and flea market, completely air-conditioned. For more information, write The Greater Louisville Hamfest, PO Box 34444, Louisville KY 40232, or phone (502)-634-0619.

### VIRGINIA BEACH VA
### SEP 26-27

The 6th annual Tidewater Hamfest-Computer Show and ARRL Roanoke Division Convention will be held in the Virginia Beach Pavilion on September 26-27, 1981. Featured will be ARRL, traffic, and DX forums and XYL free bingo. FCC license exams will be given to those sending a form 610 request in advance. Free transportation to the oceanfront will be provided for the Neptune Festival. Admission is $3.50. There will be an advance ticket drawing for a handheld FM transceiver. Flea market tables are $5.00 for one day or $7.00 for both days. For tickets and information, write TRC, PO Box 7101, Portsmouth VA 23707, or phone (804)-587-1695.

### GAINESVILLE GA
### SEP 27

The 8th annual Lanierland ARC Hamfest will be held on September 27, 1981, beginning at 9:00 am in the Holiday Hall at the Holiday Inn, Gainesville GA. Doors will open at 8:00 am for dealer setups, and free tables and an inside display area will be provided. A large parking lot will be available for the flea market, and all activities and facilities will be free to all. A boat anchor auction and prize drawings will be featured. Prize tickets are $1.00 each or 6 for $5.00. Food will be available next door. Talk-in on 146.07/.67. For more information and free dealer space reservations, contact Paul Watkins W4FDK, Rte. 11, Box 536, Gainesville GA 30501, or phone (404)-536-8280.

### GRASS VALLEY CA
### SEP 27

The Golden Empire Flying Club and Radio Systems Technology are pleased to announce the annual fly-in and avionics swap meet to be held at the Nevada County (CA) Airpark on Sunday, September 27, 1981. The pilot of any antique or homebuilt aircraft will receive a free "miner's lunch" and a beverage of the pilot's choice. Pastries, bratwurst, and hot dogs will be available also. The swap meet will be free. Table space is limited and it is first-come, first-served. This is the only swap meet in the country to feature the trading of used avionics products. Pilots are reminded that Nevada County Airport is considered a mountain strip, and are advised to check density altitude. For more information, contact Golden Empire Flying Club, PO Box 375, Grass Valley CA 95945.

### BEREA OH
### SEP 27

The 7th annual Cleveland hamfest will be held on Sunday, September 27, 1981, at the Cuyahoga County Fairgrounds, Berea OH, from 0800 to 1500. Exhibitors' 8-foot spaces are $25.00 (which includes a table). Also, power is available if requested in advance. For more information, write Cleveland Hamfest Association, Box 27211, Cleveland OH 44127.

### ADRIAN MI
### SEP 27

The Adrian Amateur Radio Club will hold its hamfest on September 27, 1981, at the Lenawee County Fairgrounds, Adrian MI, from 8:00 am to 3:00 pm. There will be prizes, games, and programs. Limited tables available and inside space available for your table. Tickets are $1.50 in advance; $2.00 at the door. Talk-in on 146.31/.91 and .52. For tickets, tables, and information, contact the Adrian Amateur Radio Club, Inc., PO Box 26, Adrian MI 49221. Tables reserved by check no later that September 20.

### NEW LONDON NH
### SEP 27

The 5th annual Connecticut Valley FM Association hamfest/flea market will be held on Sunday, September 27, 1981, from 9:00 am to 5:00 pm at the King Ridge Ski Area, New London NH. Adult admission will be $1.00 and flea market setup will be $5.00. Children under 16 will be admitted free. The food concession will be by King Ridge.

# NEW PRODUCTS

### STANDARD KEYBOARD CATALOG AVAILABLE

A 24-page catalog of standard keyboards is now available from George Risk Industries, Inc. Bulletin KB-20 includes data on the company's Model 753, 756, and 771 standard keyboards, plus a variety of new models ranging from 10 to 98 keys. Featured are the new process control keyboard with serial I/O for industrial control system applications, user-programmable ASCII keypads, and a full complement of keyboard enclosures and accessories. Off-the-shelf models include low-cost units for hobby/educational use and keyboards suitable for a variety of prototype, limited production, and specialized applications. Ruggedized versions for heavy-duty industrial and military applications are also offered.

Free copies may be requested from *George Risk Industries, Inc., GRI Plaza, Kimball NE 69145; (800)-445-5218.* Reader Service number 482.

### LOW-COST DATA TERMINAL INCLUDES COLOR GRAPHICS

A microprocessor-controlled, interactive data terminal with color graphics, reverse video, programmable and resident character sets, selectable baud rates and data formats and a light-touch, flexible-membrane keyboard with finger positioning overlay and aural feedback has been introduced by RCA MicroComputer Products.

This professional quality terminal is suitable for a wide variety of applications requiring interactive communication between computer and user. Microprocessor intelligence and LSI video control circuits bring performance, features, and flexibility at low cost.

This versatile terminal can be interconnected with standard RS232 modems for communication across telephone lines. The VP-3301 is compatible with most time-sharing and data-base computer networks.

The character display format, 40 characters by 24 lines or 20 characters by 12 lines, is software selectable. Each character or all characters may be displayed in one of eight colors (or gray scales on a B/W display). The display background may be one of eight colors (or gray scales on a B/W display). There are 125 resident displayable characters or you can define your own characters—Greek letters and other foreign alphabets, graphic symbols, large graphics building blocks, playing card suits, unique character fonts, and "little green men." The reverse video feature creates visual emphasis on single or multiple characters, words, or lines.

The terminal communications interface is industry standard asynchronous RS232C or 20-mA current loop with six switch-selectable baud rates. Switch-selectable configuration control includes line/local, upper case only, full/half duplex, data word formatting, plus two control code options. A built-in tone generator, used for aural keypress feedback, can be programmed for end-of-line bell, error messages, or even music.

The terminal utilizes modern flexible-membrane keyswitches with a light positive activation pressure. Contact life is rated at greater than five million operations. A finger-positioning overlay combined with the positive keypress action gives good operator "feel." The unitized keyboard surface, impervious to liquids or dust particles, combined with high-noise-immunity CMOS circuitry, make this unit particularly suitable for use in hostile environments.

The base-band video output can be directly connected to a 525-line color or black-and-white video monitor or with an rf modulator to a standard color or black-and-white TV set. A wall-receptacle-type power supply is included.

For more information, contact *RCA MicroComputer Products, New Holland Avenue, Lancaster PA 17604; (717)-397-7661.* Reader Service number 485.

*GRI's new keyboard catalog.*

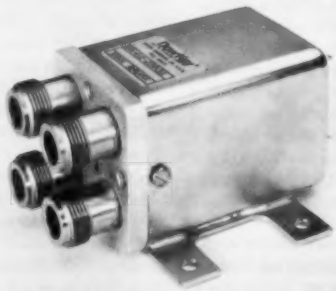
### DOW-KEY'S HIGH-FREQUENCY TRANSFER RELAY

The Dow-Key Division of Kilovac corporation has announced the availability of a new high-frequency transfer relay. The Model 412 has four type N female connectors and carries up to 1000 Watts (CW) at dc and 150 Watts at 4.2 GHz. The Model 412 is available in latching and non-latching versions, each with optional form "C" indicator circuit contacts.

The Model 412 has excellent rf characteristics: Minimum isolation at 1 GHz is −85 dB and at 4.2 GHz is −70 dB. Vswr is less than 1.1 at 1 GHz and 1.25 at 4.2 GHz. Insertion loss is −.15 dB maximum at 1 GHz and −.25 dB at 4.2 GHz. The relay was developed for use in Microwave systems to 4.2 GHz. It is ideally suited for transmit/receive switching between an antenna and a dummy load. The relay may also be used to bypass or insert a circuit element.

For further information, con-

*RCA's VP-3301 data terminal.*



*Dow-Key's Model 412 transfer relay.*

tact *Kilovac Corporation, PO Box 4422, Santa Barbara CA 93103; (805)-684-4560.* Reader Service number 487.

### EZ CORD CONTROL™

Colton Creators, Inc., has developed a new product called the EZ Cord Control™. The patented new product provides an excellent means of holding and dispensing extension cords, coax, twin-lead, and all the other types of cable that have a way of accumulating in a ham shack. This cable organizer is available in three different sizes.

For more information, contact *Colton Creators, Inc., 216 East Second Street, Mineola NY 11501.* Reader Service Number 484.

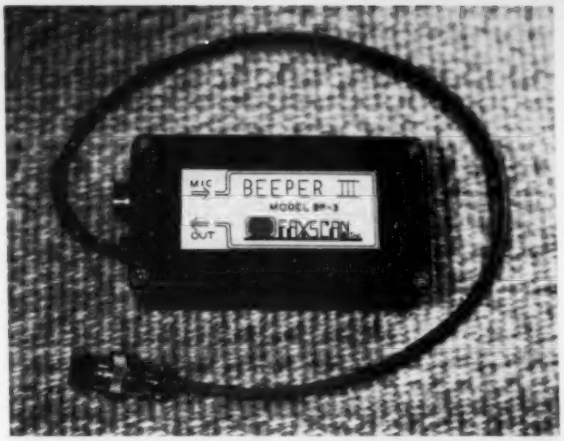
### TRI-EX ROTATING TOWER

A new 120-foot guyed rotating tower has been released by the Tri-Ex Tower Corporation. This tower should be of special interest to contesters and other hams who wish to mount yagi arrays in various configurations on the sides of the tower. With this tower, though, these side-mounted antennas can be rotated in any direction just by turning the tower.

Despite its 120-foot height, the tower turns easily by hand, although it is more conveniently rotated by a motorized rotator. The rotator mechanism is mounted inside the tower at its base where it is easily accessible and is completely enclosed for weather protection, reliability, and safety. There are no exposed chain drives or gears which could be a safety hazard to people who enter the tower-site area.

Ball-bearing-type guy attachment rings are at the 30', 70', and 110' tower levels. A mast may be inserted at the top of the tower for additional antennas which can be rotated independently of the tower and its side-mounted antennas.

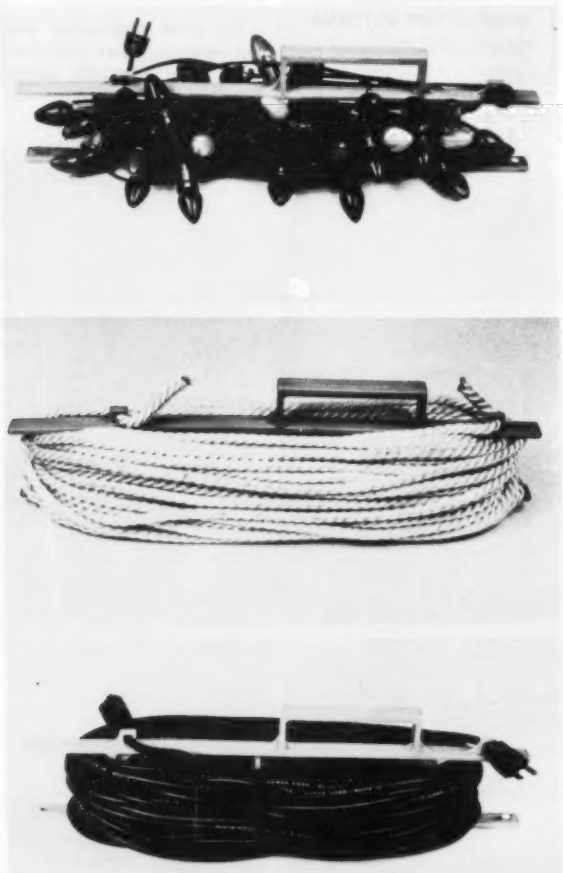
For more information, contact *Tri-Ex Tower Corporation, 7182 Rasmussen Avenue, Visalia CA 93291.* Reader Service number 488.



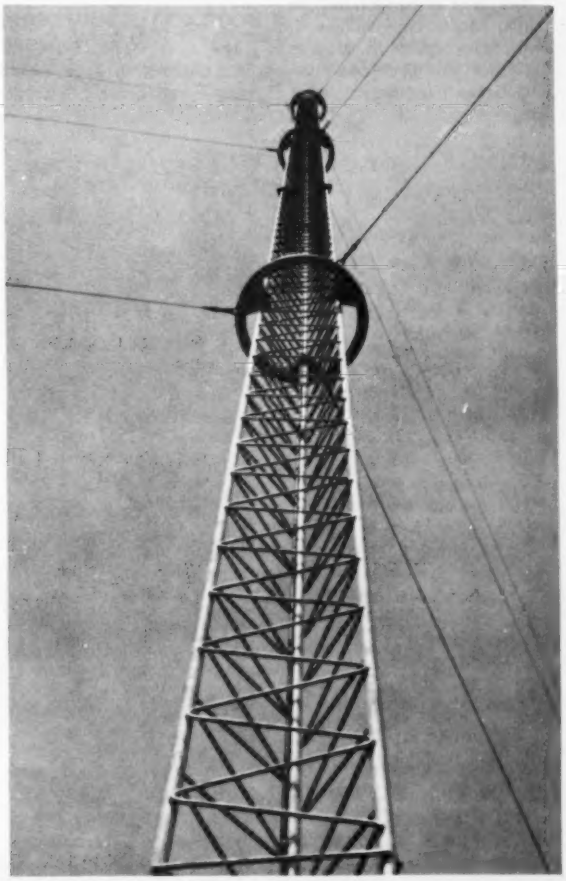

*Faxscan's BP-3.*

### FAXSCAN'S MODEL BP-3 BEEPER

Faxscan, Inc., has announced their Model BP-3, representing the introduction of a new concept for amateur radio operating ease. The BP-3 is based on the idea used for years in commercial, military, and space communications. It provides a gentle beep at the beginning and end of each transmission by sensing the voltage on the PTT



*The EZ Cord Control.*



*Tri-Ex's rotating tower.*

line. Further, to differentiate between transmit and receive, the transmit tone has a higher frequency.

The purpose of the unit is to encourage a more natural conversation by eliminating the need to say "over" after each transmission. Under noisy or crowded conditions, the BP-3 virtually eliminates talk-over.

The unit can be directly interfaced to almost all modern gear. The only basic requirement is that the transmitter be keyed by grounding the PTT line and that the voltage at that point not exceed 24 V dc nor the current exceed 100 mA.

The construction is entirely solid state, with CMOS circuitry used to provide a unit that is virtually rf-proof. Current requirements are so low that a single 9-V battery (not supplied) will power the unit for up to one full year.

The BP-3 is perfect for use during nets or emergencies, or under noisy conditions. It is also great for VHF/UHF operation and makes a perfect repeater accessory.

The unit is available as "board-only" or encased. Both are fully assembled and tested. The "board-only" version, a mere 2" × 2", allows for custom installation.

The encased version comes complete with standard 4-pin microphone connectors, shielded cabling, and all interface wiring completed. It is designed for use with rigs using the standard 4-pin connector but instructions are enclosed to modify it for use with most modern gear. The unit is mounted in a "Faxscan gray" cast aluminum enclosure measuring 2-3/8" × 4-3/8" × 1-7/32" (W, D, H). Connection to most rigs involves plugging the mike into the BP-3 and the BP-3 into your rig's mike connector. Operation is totally automatic.

For more information, contact *Faxscan, Inc., 3148 Dorf Drive, Dayton OH 45418.* Reader Service number 483.

## MODEL SDI-1150 SLIDE MOUNT

The new Model SDI-1150, quick-connection slide mount being introduced by Scientific Dimensions, Inc., will disconnect ten circuit leads plus coax. Designed for use with mobile two-way radios through the UHF band, this product will handle six more accessory leads than the Model SDI-1050 (which disconnects four circuit leads plus coax). The model SDI-1050 has been reliably used in the mobile two-way market for over five years.

The theft prevention and radio switching capabilities of the Scientific Dimensions line of quick-connection slide mounts have been applied to uses in construction, trucking, oil and gas, small service business, amateur radio, and utilities. The patented product line is sold to Motorola, General Electric, and professional land-mobile radio dealers nationwide.

For more information, contact *Scientific Dimensions, Inc., PO Box 26867, Albuquerque NM 87125.* Reader Service number 481.

## HY-GAIN'S NEW DOUBLE ZEPP ANTENNA

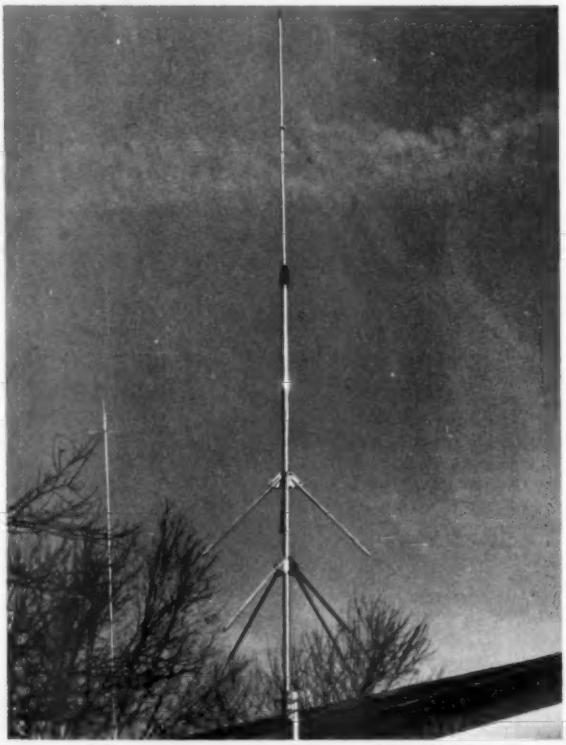
Telex Communications' new V-2 antenna is a 2-meter extended double zepp vertical consisting of two stacked 5/8-wave sections decoupled inside the antenna for complete weatherproofing. The decoupling system allows no rf on the coax feedline. The V-2 is a complete antenna that is easy to assemble and will mount on any mast up to 2" (50.8 mm) in diameter.

Two sets of 1/4-wave radials and a centered feedpoint produce an excellent radiation pattern that is very close to the horizon with a minimum of power loss into the sky. Radiation pattern testing was achieved on a ground-reflection range designed according to IEEE standard 149-1979; the test results of the V-2 and various competitive products are available from Telex/Hy-Gain.

The V-2 is designed to operate from 138 MHz through 174 MHz, obtains a vswr of less than 1.5:1 at resonance, and has a 2:1 vswr bandwidth of at least 7 MHz. The antenna's isolation from the supporting mast is 20 dB minimum.

For more information, contact *Hy-Gain, a division of Telex Communications, 9600 Aldrich Ave. So., Minneapolis MN 55420.* Reader Service number 486.

*Scientific Dimensions' Model SDI-1150 slide mount.*



*Hy-Gain's V-2 double zepp vertical.*

**There has never been a better time to subscribe to 73.**

**Ever.**

*See page 117*

**HF5V-III** *from page 34*

best. To tune the HF5V-III, you simply loosen a wingnut and slide the loading coil up or down. There are separate loading coils for 80 and 40, and adjustment of these coils has a negligible effect on the resonance point on 20, 15, and 10. Use a waterproof marker to mark the position of the bottom of the coil for the phone and CW segments and you'll be able to readjust the antenna without even getting near your swr meter!

The other reason I chose the HF5V-III is the obvious care that went into its design and engineering. Butternut designed this antenna to be as efficient as possible on each band. The following theory of operation is excerpted from the instruction manual.

"The HF5V-III operates as a slightly extended quarter-wave radiator on 15 meters, using a quarter-wave decoupling stub to isolate the upper sections of the antenna from the first quarter-wavelength of that band. On 20 meters, the entire radiator is active and functions as a 3/8-wave resonant vertical having much higher radiation resistance than conventional or trapped antennas with heights of one-quarter wavelength or less. On 10 meters, the HF5V-III operates as a 3/4-wave radiator with considerably greater efficiency than quarter-wave types. On 40 and 80/75 meters, the appropriate resonator circuits provide the inductive reactance required for resonance in conjunction with a slight top loading effect from the 15-meter decoupling stub. The L/C ratios of the 40- and 80/75-meter resonator circuits also determine resonance on 20 and 10 meters. Because of the higher than normal 20-meter radiation resistance, the feedpoint impedance on that band is in the neighborhood of 100 Ohms in a typical installation. Therefore, a quarter-wave matching section of 75-Ohm line is used as a transformer for the 50-Ohm impedance of the main transmission line. This matching section has no appreciable effect on operation on other bands."

Power rating is two kW PEP on 40 through 10 meters, and 1.2 kW PEP on 80 and 75 meters. Bandwidth is quite good, covering the entire 40-, 20-, 15-, and 10-meter bands and approximately 100 kHz on 80 meters. With the optional 160-meter attachment, bandwidth is considerably narrowed on 80 and 40 but still covers the entire 20-, 15-, and 10-meter bands. Wind load is 1.5 square feet; overall height is 26 feet. Shipping weight comes in at 12 pounds, and DXpeditioners may be interested in the special version that allows the antenna to be packed in a relatively small package, with no change in operating characteristics.

### Installation

Both roof and ground mounting are straightforward and uncomplicated. It takes less than two hours working at a leisurely pace to assemble a Butternut HF5V-III. The parts fit well and needed no remedial hacking or drilling. Both antennas I built required no adjustment beyond setting the 80- and 40-meter coils for the desired portion of the band. The instruction manual is very well done, with clear assembly instructions and diagrams. There are lots of hints on installation and ample detail on ground systems and their necessity. For the roof-mounted antenna, I used the excellent tuned radial kit that Butternut offers. A system of non-resonant radials resides beneath the ground-mounted antenna, with several wires in excess of 350 feet.

If you are interested in a vertical antenna and can't decide whether to mount it on the ground or on your roof, you should know that indications are that the roof-mounted antenna will be the superior performer. In any case, laying the required radial system for a ground-mounted vertical can be extremely time-consuming. I calculate that the time I spent installing the radials for my ground-mounted vertical would have easily paid the difference between a vertical and a small tribander to mount on my roof!

One has to be very cautious when comparing a vertical to random wire or dipole antennas. Initial comparisons between a 100-foot random wire and the HF5V-III were not particularly encouraging. I used a coax switch to flip back and forth between the antenna tuner for the random wire and the vertical, and the wire seemed to run about one S-unit higher on receive. Surprise! The low angle of radiation of the vertical made itself known when we started tuning in DX stations—DX signals were definitely stronger on the vertical!

### Conclusion

The HF5V-III goes together easily and is definitely one of the best of its breed. A vertical antenna is no match for a rhombic, yagi, or quad, but for those of us with limited real estate and funding, it represents an alternative worthy of serious consideration.

For more information, contact: *Butternut Electronics Co., PO Box 1411, San Marcos TX 78666.* ■

# RTTY LOOP

*Marc I. Leavey, M.D. WA3AJR*
*4006 Winlee Road*
*Randallstown MD 21133*

Last month I promised you something to read and something to help you write. No liar I, here we go with some summertime treats.

As I have mentioned before, one of the popular sidelights of having a RTTY machine in the shack is scouting around for non-amateur RTTY signals. The airwaves are full of such beasties, not all of which are decodable, which represent news services, government radio, and other exotic radio stations. A guide to these signals is always welcome, assuming that it is accurate and complete.

A few months ago I reviewed such a guide: Oliver Ferrell's *Guide To RTTY Frequencies*, published by Gilfer Associates, Inc., at $8.95. This month we shall take a look at another entry, a book entitled *World Press Services Frequencies.* Written by Thomas Harrington W8OMV, the book claims (Mr. Ferrell's work notwithstanding) to be the "only one of it's (sic) kind, up to date," and to lead to "exciting news from the far corners of the world." Pretty tall order; let's take a look.

The book's format is in the large, 8½" by 11" size that most electronic magazines have adopted, in contrast to the 9" by 6" size of the Gilfer book. However, the typography is wide open and large, with generous margins and spaces between lines, accompanied by a cute logo of the world on each page. This severely limits the content of each page.

The opening section of the book is a brief, two-page introduction to RTTY, giving the basic "way in" to reception. It appears to be oriented for the non-amateur, or at least for the amateur not involved with RTTY. Next comes a short discussion of time zones, shift, speed, and Baudot (sic) vs. "Ascii" (sic)—as opposed to Murray vs. ASCII code. The codes, however, are not explained—only mentioned. Two pages of photos of several modern receivers are featured, along with mentions of the Info-Tech, IRL FSK-1000 (reviewed here a while back), and HAL ST-6000 converters. A brief mention of printers and whiz-bang readers concludes the first section.

Information on transmitting RTTY stations is presented in several lists. About 225 entries are for world press stations, listed in order of transmitting

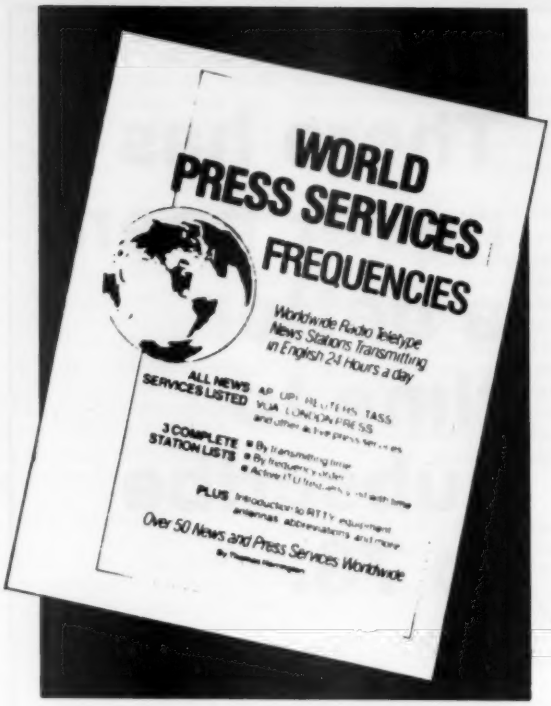



*Fig. 1. The Harrington book.*

times. A second list contains about 150 entries, describing these same stations in order of frequency. A third list shows International Telecommunications Union press stations in frequency order, showing about 250 stations.

The author indicates his intent to update the information in his book periodically and mail updates to registered individuals. This is an ambitious undertaking and would certainly do much to keep the information current. I should note that this book states, as does the Gilfer one, that all stations listed have been monitored and that this is not just a compilation of stations from a frequency log.

*World Press Services Frequencies* is available for $5.95 from Universal Electronics, Inc., 1280 Aida Drive, Reynoldsburg OH 43068. It does not have all the listings presented in the Gilfer book, but it may be entirely adequate for the amateur interested in listening in to world press services.

Of course, the other half of my promise, something to write with, is a printer. I have got to tell you about one of the hottest new printers around—one you may have heard about already. Let's take a look at some of its features.

This is a dot-matrix printer that supports the full ASCII character set, numerics, symbols, and upper- and lowercase. The print line is a maximum of eight inches and can be configured with character sizes yielding 40, 66, 80, or 132 characters per line. Furthermore, while standard line spacing of six lines per inch is the default condition, the printer may be switched to eight lines per inch (1/8 inch per line) or a tight 7/72-inch spacing. The resolution may be controlled even further to give one-dot vertical spacing or twenty-four-dot double spacing, all under program control.

Like more? The lower case g, p, q, and y all have descenders that make them look more like the letters we are used to. And a double-strike mode is available to fill in the gaps between dots and approach what is commonly referred to as "letter quality."

Like to see a sample? Fig. 3 is a sample printout, set up for 132 characters per line and eight lines per inch. The justification, by the way, is provided by my 6800-based computer. I think this is quite acceptable, don't you?

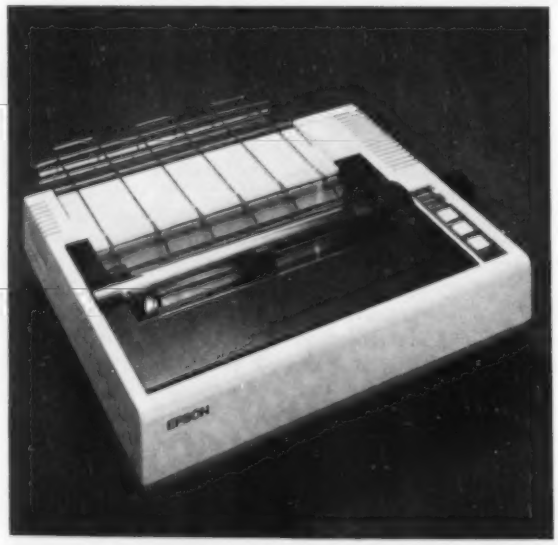



*Fig. 2. The Epson MX-80.*

How about graphics? Well, the standard TRS-80™ graphics character set is supported and usable by even the non-TRS-80 user. Speaking of character sets, flick a DIP switch inside and you can get any one of several foreign language character sets. French, complete with accents, British (the pound sterling, you know), or German, mit der Umlaut, are all available. Not only that, but an entire Japanese Katakana character set may be substituted for the TRS-80 graphics, again, at the flip of a DIP.

Still not impressed, huh? Would you like a vertical format unit that supports vertical tabs? You got it. How about a built-in beeper/bell to sound off for fun, or to tell you something's wrong? That too. Let's add a standard parallel interface that will plug in to just about any computer, and see what we've got.

At a list price of $645, but being sold at considerable discounts, we have the Epson MX-80 printer. Quite a bundle, I'd say. But before we conclude, let's look at some problems. First off, the MX-80 has a one-line buffer for input. One of the nice things about a printer with at least several hundred bytes of buffer is the ability of the printer to "follow" the computer. The computer can dump its output to the printer quickly and then proceed with processing while printing is going on, neatly overlapping functions. With a one-line buffer, this rarely happens, so the computer sits and waits for the printer to finish.

Furthermore, if the MX-80 is used in the serial mode, the user must be aware that the printer will not accept input while the carriage is returning or other functions—such as graphics—are going on. This necessitates the addition of nulls into the data stream, somewhat slowing the printer throughout.

A minor problem is that the platen cannot be moved manually while the printer is energized. Thus, if a slight adjustment is needed, say to place print on a form, the printer must be turned off and any conditions set up in the printer's memory are lost.

All things considered, however, the MX-80 is a gem of a printer. Several new accessories, including full dot graphics and friction feed, broaden the horizon of this versatile unit. At least one manufacturer of a microcomputer-based RTTY station, Microlog, features the MX-80 as a companion to their unit. If you are looking for a printer, take a long look at the Epson MX-80.

Now, every few months I feel I must repeat this request. If you write me or any other author whose works you enjoy, please enclose a self-addressed, stamped envelope if you expect a reply. Also, remember to mention RTTY Loop and *73 Magazine* to those companies whose products you read about in these pages. They appreciate the feedback.

Speaking of feedback, we will have some next month. Look for it in RTTY Loop!

A few months ago I reviewed such a guide, Oliver Ferrell's "Guide To RTTY Frequencies", published by Gilfer Associates, Inc., at $8.95. This month we shall take a look at another entry, a book entitled "World Press Services Frequencies", costing $5.95, from Universal Electronics, Inc. Written by Thomas Harrington, W8OMV, the book claims, Mr. Ferrell's work notwithstanding, to be the "only one of it's (sic) kind, up to date," and to lead to, "exciting news from the far corners of the world." Pretty tall order, let's take a look.

*Fig. 3. Sample printer output.*

# LETTERS

### THE FIRST COAX?

In his article "Inside Coax" (*73*, May, 1981, p. 78), Dr. Jenkins states that "Prior to World War II, coaxial cable was unheard of."

In 1940, Rex Bassett sold me 50' of coaxial cable at his factory in downtown South Bend, Indiana. He used some kind of rubber as the dielectric. By today's standards, and I think Mr. Bassett will agree, it wasn't too efficient. But it was coaxial cable and I used it to feed my 10-meter antenna for over a year before WWII shut down ham radio.

By coincidence, on page 37 of the same issue, I see Rex Bassett is still in business some 41 years later, having moved his plant from South Bend to Fort Lauderdale.

**Robert H. Pearson KH6AKW**
**Aiea HI**

### A SNAP

You can chalk up another ham as a direct result of your code-practice tapes. The FCC 5-wpm exam really was a snap after working with the 6+ tape.

So, now I am on to the 13+ and an Advanced license. Thanks for making the code test easy!

**William B. Schneider**
**Technician (no call yet, but passed the test)**
**Jacksonville FL**

### LESS IS MORE

Just two weeks ago, I had a rare privilege. Upon arriving at the home QTH, my son informed me that my new *73 Magazine* had arrived in the mail.

That event was like a cool breeze on a warm day. Finally, I could once again be in contact with my hobby through the auspices of your very fine magazine.

Keep up the fine work and to Mr. Wayne Green, even if you are wrong a fair amount of the time, Wayne, you are upholding a fine north-American tradition of saying your piece in a free press. Stay in there and keep on slugging.

I might add that I was slightly sorry to see a magazine which, while it is up in price, is down in thickness and we therefore seem to be receiving somewhat less for our money. Will be looking forward to receiving future copies.

**L.E. Babcock, Sr. VE6BAQ**
**Edmonton, Alberta**
**Canada**

### GETTING HIGH

I rarely write to a magazine, however the article in the June *73*, "Repeater at 102,000 Feet!" by VE4FK, certainly was outstanding in all ways. Give us more like this!

**Kenneth C. Haas K2YKE**
**Buffalo NY**

### MOUNTAINTOP PARTY

On August 1, 1981, there will be an Amateur Radio Mountaintop VHF Party. From the lowest to the highest, pick your favorite peak. Bring yourself, a friend, your two-meter portable FM station, and go for the top. The official time will be Saturday, from 1000 to 1500, local time. The official frequencies will be 146.55, 6.58, 147.51, and 7.57. The WA6GUO/WA6SUW team will be looking for stations on mountain peaks from the top of 14,000 ft. Mt. Shasta, in northern California. For further information, call Dave Bermann WA6GUO at (916)-877-5606. This is not a contest, just a big party.

**David A. Bermann WA6GUO**
**Paradise CA**

### IN COHERENT CW

This a note from an amateur, HS4AMI, 420 km, seven hours northeast of Bangkok. When I came here in September, 1980, the ARRL said they would ship my amateur club a couple of their Friendship transmitter kits—but nothing arrives. Oh, well, "drinking" executives can't do everything.

I am teaching amateur radio as an extra course to science and engineering students. We are progressing through tuned circuit to antenna theory.

My coherent CW experiments have been a great success: 559 both ways to California with 1 Watt, on 10 meters. We are going for 100 mW over 10,000 km, at 10 baud, with 24 dB gain and *no* filter. We will be happy to hear if our 10-100 mW are heard on the east coast.

Our format is at a 10-baud, crystal-controlled rate. We send

dots for tuning and then ident on 14,049,000 Hertz ± 1 Hz at 1500 and 2300Z every day.

The transmission can be heard on any receiver. The big gain is when you have the digital filter.

**George Collins HS4AMI**
**Khon Kaen University**
**Khon Kaen, Thailand**

### SPREAD THE WORD

I just read Wayne's editorial in *73* in the June, 1981, issue and found it very interesting. You say Japan has twice as many hams as the USA. I can believe this. I'm 51 years old, no kid, and have reasonable intelligence, but it took me 11 months to find out how I could become a ham. After all that time, I get to go to my first lesson for my Novice tonight.

I'm really excited because I think it's a great hobby and will probably invest approximately $2000 for equipment. But what a shame it took me so long to find out how to start. The problem is that you guys are like a secret organization.

I checked all over on clubs and how to get started, (Radio Shack, local electronics parts' houses) and all I got was (at Radio Shack) the advice to read a book. I didn't want to read a book, I wanted to talk to someone. I couldn't check antennas on roofs because CB and ham antennas look alike to me.

So maybe if you folks would put out signs at Radio Shack, etc., about clubs and classes it would help build up amateur radio. I don't mean to be a wise guy, but if you folks did more to promote the hobby, more of us would find out about it. There may be 1000s of people out here just trying to find out where to start.

**Robert W. Simpson Sr.**
**Glen Mills PA**

### SEEING-EYE HAM

I would like to see a "thank you" printed in your magazine. I drive a semi truck and was directed to the heart of New York City, New York, by a person that did an excellent job. I didn't make one wrong turn and was led by the hand via 2 meters for about four hours without a let-up.

I found out later that Butch N2CGQ was blind!

I didn't think much about that because if a person lives in a place many years, he could direct you around town from his QTH. But I just found out yesterday that the fellow only knew New York by what had been described to him. So, Butch put his Seeing-Eye dog aside to help me find my way.

Thank you, Butch, for your assistance and keep up the nice work.

**Leo Mercer**
**Albert Lea MN**

### ANOTHER POLL?

After having thoroughly enjoyed John Edwards' poll in the June, 1981, issue, I decided to conduct a survey of 20-meter CW. The following results were tabulated:

90% think they have keyers that stick.
2% think I have a receiver that chirps.
87% of those calling CQ are named Noah (why else would they sign with ARK?).
100% think that even though I am hundreds of miles away I am concerned that it is raining there.
67% are quick to point out that they have no problems when I tell them I have TVI.
45% think the band is in bad shape.
13% just got home from school.
12% are just leaving for work.
8% think the QSB is very bad and could I help by slowing down.

I am ever willing to add to the fund of ham radio knowledge.

**James F. Reid W8LWS**
**Laurel MD**

### GOOD OLD RAY

I am writing to try to clear up a problem I've had ever since I was assigned the call letters W2YI in 1977: I've received many QSL cards from the bureau, dating from 1971 through 1980, for "W2YI, Ray, New Jersey."

To begin: Dear fellow radio amateurs, please accept my apology for any inconveniences you've been caused by this fellow, Ray. He is not assigned the callsign W2YI and, as the FCC has told me, he never was. They have assured me that I am the only person licensed to operate an amateur radio station with that callsign. I am sorry you've been duped by this person.

I would appreciate hearing from any amateur who has any information about good old Ray from New Jersey. He prefers to operate CW on 14 MHz and has worked mostly Europeans. I do have a few QSLs from his expeditions to 40 and 80 meters also.

The FCC has begun a monitoring program, and is fully aware of Ray's activities. It has assured me that I will not be held responsible for Ray's illegalities.

I feel Ray should get off his duff and study for his own Extra class license, since it is not that difficult. It seems he is already a licensed radio amateur, holding a General or Advanced ticket, who is too lazy to take the time to study and upgrade. Another theory holds that he is an ex-military CW operator who likes to DX a bit, but doesn't want to take a test.

And now to Ray: Ray, I am not angry or spiteful about your actions. The FCC understands that I'm not responsible for any problems that may arise as a result of your operations. I do wish to hear from you, though. Please drop me a letter, and enclose a check to cover the costs of maintaining those envelopes at the second call area QSL bureau, courtesy of the kind folks at the North Jersey DX Association.

**Jeffry M. Blackmon**
**The Real W2YI**
**7714 Lindbergh Avenue**
**Niagara Falls NY 14304**
**(716)-283-8346**

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# LOOKING WEST

*Bill Pasternak WA6ITF*
*c/o The Westlink Radio Network*
*Suite 718*
*7046 Hollywood Blvd.*
*Hollywood CA 90028*

### TOTAL OVERHAUL NEEDED

This will not be a normal Looking West column. That's not to say that you should bypass it, though. In fact, I hope that this month we will attract a far greater cross section of the amateur populace than usual. The reason will become evident as we progress.

Simply said, there's something wrong behind the so-called "Codfish Curtain." For those of you who have never heard the term before, I refer to the upper echelon at Newington. First, there was the Central Division Director's race. This is still in dispute as far as the Indiana Radio Club Council is concerned, and I suspect that Wayne will be covering this in depth. On this one, I bow to our fearless leader.

Now, on the heels of this controversy there erupts yet another. One that hits at the very foundation of amateur radio. For the people involved are considered to be the upper crust of amateur radio, the Big-Gun DXers. Why should a group of these people band together for the purpose of undermining the ARRL's DXCC program? In case you were not aware, that's what has happened. As you read on, I think that the rationale for their actions will become quite clear. If not, then tune in the low end of 20 meters and listen to a few pileups. It will become quite self-explanatory at that point.

I should preface all this with a few remarks. First, I neither condemn nor condone the action taken. I can understand the frustration of those involved. Yet I have to say that nothing has ever been accomplished by "burning down a house because you don't like the furniture inside." Second, I am not a DXer. In fact, I don't really fall into any particular category of amateur except possibly that of observer.

As the latter, I come into contact with hundreds of amateurs annually. With some, I share common interests. With others, there is no commonality. Somewhere in between there is another group: Those with whom I

became friends on a social level, while finding commonality of interest in amateur radio.

It is because of this latter involvement that I can relate firsthand the story which is about to unfold. It is based directly on a taped interview with a very well-known DXpeditioner, Dave Gardner K6LPL. Also, there will be some supposition on my part, but the supposition itself will be based upon the fact that I spent about 50 hours editing the audio tapes of Dr. Gardner's ill-fated 1979 DXpedition to Palmyra. A trip that almost cost Dave and those with him their lives.

I think that the best way to begin is to explain the situation as of this date: the 27th of May, 1980, and then present, verbatim, my interview of the 23rd with "Dr. DX." Here we go:

Westlink Newscast #193 for the week of May 25th, 1981, story item number 4: An amateur has been disqualified from DXCC, and another has quit the program as a result of a bogus QSL card scheme now roaring through the DX community. On April 23rd, the League disqualified Robert Findley W6NZX from DXCC because they allege that Findley submitted forged and counterfeit QSL cards for DXCC credit.

Now, hot on the heels of Findley's disqualification comes word that Dr. Dave Gardner K6LPL has tendered his resignation to DXCC, at the same time stating his part in what appears to be a worldwide attempt by some leaders of the DX community to effect what they feel are needed changes to the DXCC program. [At this point we inserted a 33-second sound bit with Dr. Gardner explaining what transpired and why. This will be reprinted later on, so there is no reason to duplicate it here.]

Gardner told us that the idea began at last year's Fresno International DX Convention, and that 14 well-known DXers were involved, ten of them being Honor Roll members. In our interview, Garner stressed what he felt were three key points. First, that this was not an attempt to discredit either the League or its DXCC program. Second, that all the cards involved, possibly as many as 25,000, were all pre-1975 vintage. [Ed. note: As explained later, the date was chosen to not influence those currently trying to climb the DXCC ladder or affect their standings.] Third, that his three QSL managers, W7PHO, W6AHU, and N6AHU had no knowledge or involvement in what Gardner termed to be an organized protest to point out the greed and avarice of many hams.

What action the League will take from here is unknown. A DXCC Advisory Committee member we spoke with declined to comment officially on the matter. He did say that there was no machinery set up to accept the resignation and that any action taken would be precedent setting.

OK. There you have the capsule version. Your basic one-and-a-half-minute news story. But, there is far more to it than what appears on the surface. This I learned while talking to Dave Gardner. Here is our conversation:

Q: What do you know about the bogus QSLs running around in DX circles?

A: At the 1980 Fresno International DX Convention, 14 hams were engaged in a rap session about improving the sorry state of DXing. We decided we had to get the attention of the amateur community to bring the hobby of DXing back to that which would generate some international goodwill and good times instead of this terrible race for QSL cards which has led to greed and avarice and foul language, etc., on the bands. The way we chose to do it was by flooding the world with pre-1975 QSL cards. These cards were given by the 14 members of our group, 10 of whom are Honor Roll members, to amateurs around the world. Our estimate is that about 5,000 of these cards have made it to DXCC headquarters thus far.

I do want to say that his action was not anti-League or anti-DXCC. It was designed to capture the attention of the world so that we might once again bring amateur radio DXing back to what it was before, a hobby instead of an addiction for QSL cards.

Q: What do you think will happen now?

A: I don't really know. Pre-1975 QSL cards are floating into the DXCC office [ARRL headquarters]. I hope it will help the league reassess its position about DXCC and help to take some of the violent competition out of DXing, and also help eliminate some of the bad feelings all over the world in the DX community. It's impossible for a rare DX station to get on and rag chew with a friend. He's completely smothered by people wanting QSL cards. This forces people onto lists, and that's just like reading out of the telephone book. It's certainly not DXing. All it amounts to is getting the QSL card. While I have not been anti-list in the past, I now see this as being another effect of the whole craze for QSL cards.

Q: Do you blame the DXCC program for all these problems?

A: It's not just the DXCC program. It's partly DXCC's fault, but I think the people at DXCC are well intentioned. I don't think them to be evil people trying to do bad. I do think that their policies, among other factors, have led to a general deterioration in the quality of amateur radio, and amateur radio DXing in particular.

Q: Why this route rather than the political one, i.e., lobbying for change with the DX Advisory Committee?

A: The DX Advisory Committee really has no power. They can only make recommendations to the General Manager [Note: currently Dick Baldwin W1RU] who takes it upon himself to decide what *is* a country and what *isn't*. He's a fine gentleman, but he has been unresponsive to the DX community. I just think that the League's emphasis is so far away from improving the DX conditions (operating standards) that I do not think they really care all that much. We didn't think the League would be responsive at all, because they have not been in the past.

Q: What action have you taken as a result of this so-called scandal?

A: I've personally resigned from DXCC. I know of several others whose resignations are also imminent. My resignation was tendered well before this "scandal" broke. We hope that in the future people will have a bit of a question in their minds: "Is that QSL card really necessary and is it worth the price of my own personal pride I will have to pay?"

As to my own future plans? I will continue to work my DXpeditions in the same way I have in the past. All of my own QSLs are handled by QSL managers and they were not in any way a part of this operation. I should also state that the operation is over. No more cards are going out. No more will go out. We feel we have made the point we had to, and now it's time to go on and try to improve conditions in amateur radio DXing.

There you have it! Right from the source. Dave did not name the others involved. In a subsequent conversation, he explained that it was for each of the people involved to come forward of his own accord if that person felt he wanted to. But there is something far more important than who did what involved here. In the view of this writer, it again points out the inability of League headquarters to deal with the problems of "today's" amateur radio scene. When a group of the world's top DXers has to band together outside the ARRL and try to force change, because headquarters has been unresponsive to their ongoing call for change, something definitely is awry. I think that "unresponsiveness" is the key word here and it's not just in dealing with the DXCC program and the problems some feel it creates. Let's look a bit closer to home.

On the two-meter band, there has been an ongoing call for more years than I can remember that the Board of Directors enact a specific band plan in regard to the 146 through 148-MHz repeater subband. Thus far, there is still no true standard. The east runs repeaters every 15 kHz right-side up; the west runs them every 15 kHz inverted and the Pacific northwest opted to totally recoordinate on 20-kHz centers to match the 144.5 through 145.5-MHz subband. Instead of taking a stand one way or the other, the Board continually postpones making a final decision.

OK. Most of us are lucky enough to have synthesized radios these days and most, though not all, will work under all conditions. Am I being picky? I think not. Keep in mind that several parts of the nation are currently becoming involved in what amounts to a "squeeze play." Inverted systems moving toward them from the west, and non-inverted from the east. One of these days, there may be one heck of a looped lockup when the two forces meet. And who

will suffer? The poor ham caught in the middle. Yet, the Board fails to act. Fails to take a stand. I honestly think that they are unaware of the consequences their unresponsiveness may eventually cause. But, they're going to have to take a stand and they're also going to have to learn that you cannot appease everyone, that a nationally-standardized band plan for this spectrum is essential and whatever one they choose will be unpopular in some quarters. It will probably be met with some resistance. But, choose they must.

I think that Gardner has hit upon something important, perhaps the key to what the real problem is in Newington. If this is the case, and I happen to be a League member and supporter who feels it to be so, then maybe it's time that the rank and file, you and I, start taking some positive steps toward revamping "*our*" organization to what is needed to represent us in today's fast-paced society. I've always said that criticism brings with it a responsibility of alternative, so here goes.

First, I think it's time that the rank and file members of the League are given the opportunity to elect more than just their Division Director, Vice Director, SCM, and the like. We should also be the ones who elect the President, the Vice Presidents and other upper-echelon personnel. Maybe utilize a system similar to the Electoral College as used in our own federal government. Here, though, you would vote to "direct your Director" to cast his ballot for the candidate the majority in a given Division voted for, on a popular-vote basis. If it works for the USA, it can work for the ARRL.

Then there are the many Advisory Committees whose advice seldom is heeded it seems. Suppose they were no longer Advisory Committees. Rather, each was empowered to make decisions and implement them. Here, again, you would need a change in the structure. Right now, the members of these committees are appointees of the given current League president. What they should be are elected representatives of a given Division, elected by their peers to represent their views and ideals. For instance, those serving on VRAC should be active members of the mainstream of VHF repeater operation. In other words, be active on all local 2-meter repeaters, since that's where the bulk of today's activity is. They should be accessible to their constituencies both on the air *and* on the phone. If a problem arises, they should be there to take command and arbitrate a solution. I must ask how many of you know who your VRAC representative is or how to get hold of that person on an immediate basis if an emergency were to arise?

This should hold true of all members of all special-interest committees. If you can't reach the man or woman when they are needed, if they are not willing to express your views as your representative, then why bother having such a person in the first place. By the same token, if your representative or an entire committee is ignored time after time, then the committee structure holds no value other than surface political appeasement. I know a number of people who serve on various committees of this sort, and you have no idea how frustrating it is for them to work diligently for months on end, dedicating their time and efforts in the hope of making our amateur community a better place to be, only to have a group of politicos veto, shelve, or ignore their works.

If Wayne Green and I disagree on any one point it's over the ARRL. Wayne has often stated that in regard to the League, you vote with your checkbook. That is to say, if you don't join or "re-up," you have voiced your displeasure in a way anyone can understand: in their pocketbook. I take a different view. First, I believe we need a strong national organization. Right now, the ARRL is the only game in town, and as of this writing nobody has taken the initiative to start a new organizational effort. Maybe someone will. Right now, the League is it, for better or worse. In that vein, I believe that the only way to make the ARRL into the kind of organization we need is to become active in it. Become aggressive. Work toward change. Yes, you will get shot down by the "old guard." In politics, that's the name of the game. If you have the tenacity and the courage of your convictions and if you can garner the support of your fellow hams, you can and will make your voice heard. Nothing is impossible! It merely takes dedication and the willingness to fight it out.

Since I began Looking West, I have been a League watcher. As you know, I have a very simple way of dealing with them. When they do something that's right, proper, and beneficial to amateur radio, I will be among the first to laud them for their achievements. On the other hand, when something is wrong, I will also be among the first to cast criticism. Yes, I am lucky in that I have a national platform from which to be heard, but even if this were not so, my approach would not differ.

I do not remember who coined the expression "Codfish Curtain" in describing Newington. I heard it expressed at more than one convention of late. Unlike a curtain made of iron which can only figuratively rust and decay with age, one made of organic matter can take on a rather odoriferous characteristic if left to the elements. I do not want to see this happen to the League. Not to *my* League. Yet, one must wonder when even the DX crowd has to rebel. To figuratively take to the hills, grow beards, and wage a guerrilla-type of war to get the attention of Newington. Not that I can or will condone such activities or that of any form of terrorism in the world today. Violence only begets violence; hate only begets hate. There's enough of this in the world today without it seeping into the very fiber of amateur radio.

Maybe the 14 DXers were wrong, but it's evident that they were crying out for needed change only to be met with a deaf ear from League headquarters. They made their decision and must live with it. You and I might have taken a completely different route. Nonetheless, I think the point they were trying to make is the very same one I am trying to make right here and now. A simple message to Newington that says wake up, "the times they are a changing."

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# KAHANER REPORT

*Larry Kahaner WB2NEL*
*PO Box 39103*
*Washington DC 20016*

**. . . IT'S ALL A BIG MICROPHONE**

Washington press credentials ought to carry warning labels like the ones on cigarette packs. It should read: "Danger —Covering Congress or federal agencies may result in loss of perspective."

We of the Washington press corps tend to overdo it. Granted, what happens here at the center of the empire eventually affects your life, but we probe every speech from every bureaucrat and analyze every bill even though it stands less than one in a hundred chance of becoming law. What happens as a result of that massive coverage is that we succumb to the forest/tree syndrome. Amid our hunger for details and minutia, we may not see the issues or spot the trends.

Such is the case with reportage of the government's apparent changing attitude toward regulation of the airwaves. Congress, the FCC, and other lawmakers want to change the statutes, little by little, to restrict what we see and what we hear. They wish to deny access to monitor the electromagnetic spectrum, a rather amorphous, albeit quite real, natural resource.

For the past several years, the news media has reported isolated government actions in this area but so far no one has taken a step back and looked at the big picture. *Newsweek* hasn't strung it all together, splashed it on the cover, and pronounced it a trend. Nor has NBC Nightly News run a special report at a quarter past the hour and declared it Truth.

It's not that they're poor journalists, and it's not that they don't care. It's just that we're all too close to the action to see it

clearly and understand that it isn't just a lingering fragment of the '60s paranoia.

Since 1934, when the Communications Act was passed, the law was clear. If it were sent over the air, you could receive it. If you could pick it up, you could listen. Transmissions are regulated for the public good, but receiving is public domain. That's the basis of the Communications Act and, in larger terms, a philosophy that stems from common law.

Constraints exist, however. You can't divulge anything you hear to a third party (that doesn't hold for broadcast or ham communications) but that seems fair; we can live with that.

But we're in a new age and the Communications Act needs rewriting. It's moldy, out-of-date, especially in the area of technology. Last year, Congress tried overhauling it but didn't get very far. They're trying it again this year, but it probably won't go anywhere either. For one thing, the subject is complex and most representatives are afraid to tackle it. However, if you read the proposals, last year's and this year's, you'll notice that they both include prohibitions against receiving so-called pay-TV and other private, commercial transmissions. No one argues that pay-TV operators deserve some sort of protection from video vampires who seek to steal their wares and market them for half price, but that can be handled locally on a case-by-case basis as "theft of service." Growing national policy towards regulating what we may receive seems to be traveling a dangerous path.

In another instance, the FCC has decided to amend the rules to allow licensees in the Power Radio Service to use scramblers. Service members, which includes power companies, prompted the rulemaking to reflect their concern that terrorists and vandals might intercept transmissions and somehow use the information to disrupt a nuclear power plant or blow up a group of hydroelectric generators.

The FCC gave the OK, as it did when police and fire departments requested similar permission. Unless a petitioner convinces the Commission that scrambling is a dumb idea, it becomes law on July 22.

In addition, the FCC said it will allow scramblers in other sectors of the Land Mobile Service on a secondary, noninterference basis. There was even talk of letting taxicabs scramble transmissions.

We can go on. Many states rule that you may listen to police on your scanners at home but not in your car. You may use a microwave receiver at your place of business but not in your car, because then it would be called a radar detector.

The trend is clear. More and more restraints and regulation of the public's access to transmissions that use a public resource.

FCC Commissioner Joseph Fogarty, commenting publicly on the scrambler proposal for the Power Radio Service, recommended formation of a task force "to study the problem of maintaining the privacy and security of the telecommunications network in the face of the threat by the new technologies."

Sorry, Commissioner. The problem can't be solved. There's no way that any telecommunications exchange can be made secure or private, because by its very nature the electromagnetic spectrum is like a city street. If you walk in it, you relinquish your right to privacy, and it seems that everyone really knows that *except* those who try to legislate that security and privacy.

If you want privacy, try a handwritten note. There will always be some high-tech freak who wants to exercise his right to listen and watch while you're using his natural property. Or maybe he'll just do it for the sheer challenge of breaking the code. Nevertheless, no one ever promised that airwaves would be private—in fact, the FCC has historically maintained just the opposite—and to expect it now is socially unreasonable and technologically impossible.

Perhaps the Secret Service—whose field communications consist of simple handie-talkies on easily-found VHF and UHF frequencies—says it best. After the assassination attempt on President Reagan last March, I asked a spokesman if the Service was planning any new procedures to tighten security. He asked in what areas, and I mentioned the handie-talkies. I told him I knew the frequencies and even the code words; Reagan is "Rawhide." "Isn't that a security problem?" I asked.

He replied: "We don't use scramblers because you'll only figure out how to unscramble it. And we use code names because it makes things easier for us. Our philosophy is simple: 'Say nothing over the air that you wouldn't say into a microphone connected to the loudest PA system in Washington. The telephone, the radio; it's all a big microphone, and that's the way it's always going to be.' "

# CORRECTIONS

Since my article "The Nicad Conditioner" was published in the April, 1981, issue of *73 Magazine*, I've had many letters from as far away as Honolulu complimenting me on it.

One reader did note a minor error in the diagram shown in Fig. 3 (p. 107). At the top of resistor R2, there should have been a dot to indicate a connection. Without this connection the timer module would not receive its trigger pulse.

**Mitchel Katz W2KPE**
**Flushing NY**

Re the article, "Mayday," on page 78 of the June, 1981, *73 Magazine*: After continuous operation for 7 months, we finally had our first Clegg 22'er equipment failure on the ELT detector. The failure was attributed to overheating of an audio loading resistor in the audio output stage. The problem was corrected by circuit changes and relocation of heat-generating components as detailed in Fig. 1.

The DF articles in the June issue were extremely informative and I hope will encourage further innovative advances in the state-of-the-art of DFing.

**Ed Sommerfield W2FJT**
**Poughkeepsie NY**

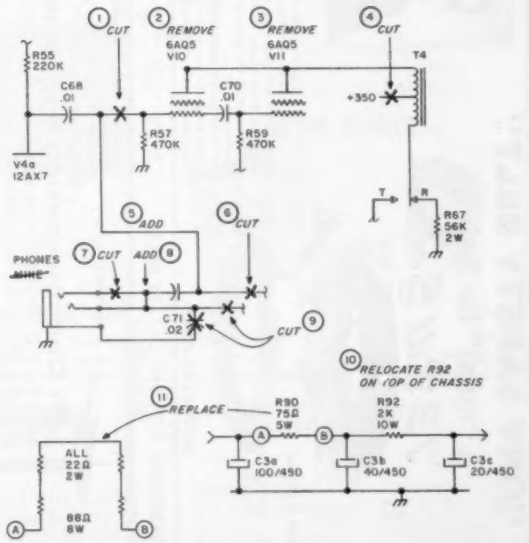


*Fig. 1. 11 changes to the Clegg 22'er ELT detector to eliminate heat problems.*

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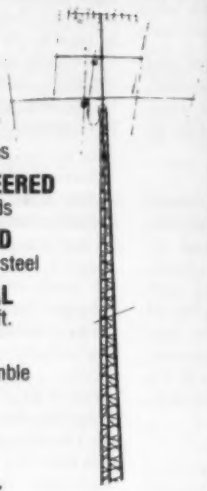

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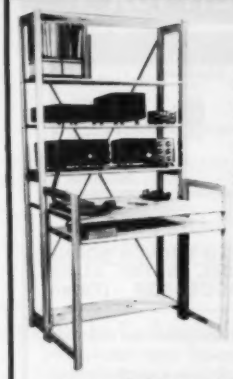

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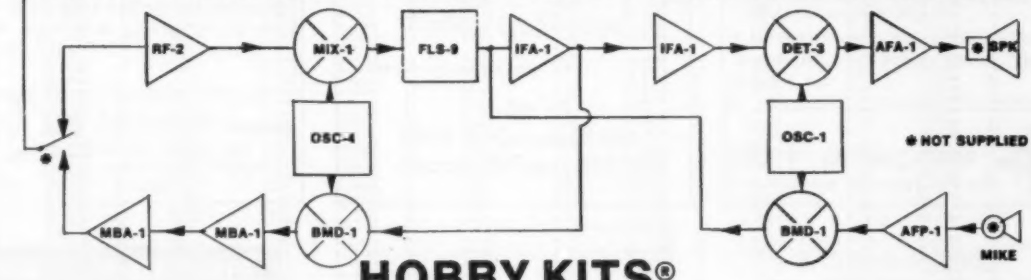


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# OSCAR ORBITS

**Courtesy of AMSAT**

The OSCAR satellites are subject to atmospheric drag, of course, and the present period of intense solar activity has accentuated the problem. During this period, our sun has been expelling huge numbers of charged particles, some of which find their way into the Earth's upper atmosphere, increasing the density (and thus the drag) there. It is through this region that the OSCARs must pass. OSCAR 8, in a lower orbit than OSCAR 7, is the more seriously affected of the two.

If the drag factor is not considered when OSCAR calculations are performed, long-range orbital projections will be in error. For example, by the end of 1979, OSCAR 8 was more than 20 minutes ahead of some published schedules. The nature of orbital mechanics is such that extra drag on a satellite causes it to move into a lower orbit, resulting in a shorter orbital period. Thus, the satellite arrives above a given Earthbound location earlier than predicted.

Using data supplied to us by Dr. Thomas A. Clark W3IWI of AMSAT, the equatorial crossing tables shown here were generated with the aid of a TRS-80™ microcomputer. The tables take into account the effects of atmospheric drag and should be in error by a few seconds at most.

The listed data tells you the time and place that OSCAR 7 and OSCAR 8 cross the equator in an ascending orbit for the first time each day. To calculate successive OSCAR 7 orbits, make a list of the first orbit number and the next twelve orbits for that day. List the time of the first orbit. Each successive orbit is 115 minutes later (two hours less five minutes). The chart gives the longitude of the day's first ascending (northbound) equatorial crossing. Add 29° for each succeeding orbit. When OSCAR is ascending on the other side of the world from you, it will descend over you. To find the equatorial descending longitude, subtract 166° from the ascending longitude. To find the time OSCAR 7 passes the North Pole, add 29 minutes to the time it passes the equator. You should be able to hear OSCAR 7 when it is within 45 degrees of you. The easiest way to determine if OSCAR is above the horizon (and thus within range) at your location is to take a globe and draw a circle with a radius of 2450 miles (4000 kilometers) from your QTH. If OSCAR passes above that circle, you should be able to hear it. If it passes right overhead, you should hear it for about 24 minutes total. OSCAR 7 will pass an imaginary line drawn from San Francisco to Norfolk about 12 minutes after passing the equator. Add about a minute for each 200 miles that you live north of this line. If OSCAR passes 15° east or west of you, add another minute; at 30°, three minutes; at 45°, ten minutes. Mode A: 145.85-.95 MHz uplink, 29.4-29.5 MHz downlink, beacon at 29.502 MHz. Mode B: 432.125-.175 MHz uplink, 145.975-.925 MHz downlink, beacon at 145.972 MHz.

At press time, OSCAR 7 was scheduled to be in Mode A on odd numbered days of the year and in Mode B on even numbered days. Monday is QRP day on OSCAR 7, while Wednesdays are set aside for experiments and are not available for use.

OSCAR 8 calculations are similar to those for OSCAR 7, with some important exceptions. Instead of making 13 orbits each day, OSCAR 8 makes 14 orbits during each 24-hour period. The orbital period of OSCAR 8 is therefore somewhat shorter: 103 minutes.

To calculate successive OSCAR 8 orbits, make a list of the first orbit number (from the OSCAR 8 chart) and the next thirteen orbits for that day. List the time of the first orbit. Each successive orbit is then 103 minutes later. The chart gives the longitude of the day's first ascending equatorial crossing. Add 26° for each succeeding orbit. To find the time OSCAR 8 passes the North Pole, add 26 minutes to the time it crosses the equator. OSCAR 8 will cross the imaginary San Francisco-to-Norfolk line about 11 minutes after crossing the equator. Mode A: 145.85-.95 MHz uplink, 29.4-29.50 MHz downlink, beacon at 29.40 MHz. Mode J: 145.90-146.00 MHz uplink, 435.20-435.10 MHz downlink, beacon on 435.090 MHz.

OSCAR 8 is in Mode A on Mondays and Thursdays, Mode J on Saturdays and Sundays, and both modes simultaneously on Tuesdays and Fridays. As with OSCAR 7, Wednesdays are reserved for experiments.

OSCAR 7 ORBITAL INFORMATION FOR AUGUST

| ORBIT # | DATE | TIME (GMT) | EQ. CROSSING (DEGREES WEST) |
|---|---|---|---|
| 30698 | 1 | 0137:11 | 104.7 |
| 30710 | 2 | 0036:29 | 89.6 |
| 30723 | 3 | 0130:43 | 103.2 |
| 30735 | 4 | 0030:01 | 88.0 |
| 30748 | 5 | 0124:15 | 101.6 |
| 30760 | 6 | 0023:33 | 86.4 |
| 30773 | 7 | 0117:47 | 100.0 |
| 30785 | 8 | 0017:05 | 84.9 |
| 30798 | 9 | 0111:19 | 98.5 |
| 30810 | 10 | 0010:37 | 83.3 |
| 30823 | 11 | 0104:51 | 96.9 |
| 30835 | 12 | 0004:09 | 81.7 |
| 30848 | 13 | 0058:23 | 95.3 |
| 30861 | 14 | 0152:37 | 180.9 |
| 30873 | 15 | 0051:55 | 93.8 |
| 30886 | 16 | 0146:09 | 107.3 |
| 30898 | 17 | 0045:27 | 92.2 |
| 30911 | 18 | 0139:41 | 105.8 |
| 30923 | 19 | 0038:58 | 90.6 |
| 30936 | 20 | 0133:13 | 104.2 |
| 30948 | 21 | 0032:30 | 89.0 |
| 30961 | 22 | 0126:45 | 102.6 |
| 30973 | 23 | 0026:02 | 87.5 |
| 30986 | 24 | 0120:16 | 101.1 |
| 30998 | 25 | 0019:34 | 85.9 |
| 31011 | 26 | 0113:48 | 99.5 |
| 31023 | 27 | 0013:06 | 84.3 |
| 31036 | 28 | 0107:20 | 97.9 |
| 31048 | 29 | 0006:38 | 82.8 |
| 31061 | 30 | 0100:52 | 96.4 |
| 31073 | 31 | 0000:09 | 81.2 |

OSCAR 8 ORBITAL INFORMATION FOR AUGUST

| ORBIT # | DATE | TIME (GMT) | EQ. CROSSING (DEGREES WEST) |
|---|---|---|---|
| 17360 | 1 | 0029:13 | 69.3 |
| 17374 | 2 | 0033:51 | 78.5 |
| 17388 | 3 | 0038:30 | 71.7 |
| 17402 | 4 | 0043:08 | 72.0 |
| 17416 | 5 | 0047:47 | 74.0 |
| 17430 | 6 | 0052:25 | 75.2 |
| 17444 | 7 | 0057:03 | 76.4 |
| 17458 | 8 | 0101:42 | 77.6 |
| 17472 | 9 | 0106:20 | 78.8 |
| 17486 | 10 | 0110:58 | 79.9 |
| 17500 | 11 | 0115:37 | 81.1 |
| 17514 | 12 | 0120:15 | 82.3 |
| 17528 | 13 | 0124:53 | 83.5 |
| 17542 | 14 | 0129:31 | 84.7 |
| 17556 | 15 | 0134:09 | 85.9 |
| 17570 | 16 | 0138:47 | 87.0 |
| 17583 | 17 | 0999:14 | 62.4 |
| 17597 | 18 | 0004:52 | 63.6 |
| 17611 | 19 | 0009:30 | 64.8 |
| 17625 | 20 | 0014:07 | 66.0 |
| 17639 | 21 | 0018:45 | 67.1 |
| 17653 | 22 | 0023:23 | 68.3 |
| 17667 | 23 | 0028:01 | 69.5 |
| 17681 | 24 | 0032:38 | 70.7 |
| 17695 | 25 | 0037:16 | 71.9 |
| 17709 | 26 | 0041:54 | 73.1 |
| 17723 | 27 | 0046:31 | 74.2 |
| 17737 | 28 | 0051:09 | 75.4 |
| 17751 | 29 | 0055:46 | 76.6 |
| 17765 | 30 | 0100:24 | 77.8 |
| 17779 | 31 | 0105:01 | 79.0 |

OSCAR 7 ORBITAL INFORMATION FOR SEPTEMBER

| ORBIT # | DATE | TIME (GMT) | EQ. CROSSING (DEGREES WEST) |
|---|---|---|---|
| 31086 | 1 | 0054:24 | 94.8 |
| 31099 | 2 | 0140:38 | 108.4 |
| 31111 | 3 | 0047:55 | 93.2 |
| 31124 | 4 | 0142:09 | 106.8 |
| 31136 | 5 | 0041:27 | 91.6 |
| 31149 | 6 | 0135:41 | 105.2 |
| 31161 | 7 | 0034:59 | 99.1 |
| 31174 | 8 | 0129:13 | 103.7 |
| 31186 | 9 | 0028:31 | 88.5 |
| 31199 | 10 | 0122:45 | 102.1 |
| 31211 | 11 | 0022:02 | 86.9 |
| 31224 | 12 | 0116:16 | 100.5 |
| 31236 | 13 | 0015:34 | 85.4 |
| 31249 | 14 | 0189:48 | 99.0 |
| 31261 | 15 | 0009:06 | 83.8 |
| 31274 | 16 | 0103:20 | 97.4 |
| 31286 | 17 | 0002:38 | 82.2 |
| 31299 | 18 | 0056:52 | 95.8 |
| 31312 | 19 | 0151:06 | 109.4 |
| 31324 | 20 | 0050:23 | 94.3 |
| 31337 | 21 | 0144:37 | 107.8 |
| 31349 | 22 | 0043:55 | 92.7 |
| 31362 | 23 | 0138:09 | 106.3 |
| 31374 | 24 | 0037:27 | 91.1 |
| 31387 | 25 | 0131:41 | 104.7 |
| 31399 | 26 | 0030:58 | 89.5 |
| 31412 | 27 | 0125:13 | 103.1 |
| 31424 | 28 | 0024:30 | 88.0 |
| 31437 | 29 | 0118:44 | 101.6 |
| 31449 | 30 | 0018:02 | 86.4 |

OSCAR 8 ORBITAL INFORMATION FOR SEPTEMBER

| ORBIT # | DATE | TIME (GMT) | EQ. CROSSING (DEGREES WEST) |
|---|---|---|---|
| 17793 | 1 | 0109:39 | 88.1 |
| 17807 | 2 | 0114:16 | 81.3 |
| 17821 | 3 | 0118:53 | 82.5 |
| 17835 | 4 | 0123:31 | 83.7 |
| 17849 | 5 | 0128:08 | 84.9 |
| 17863 | 6 | 0132:45 | 86.0 |
| 17877 | 7 | 0137:22 | 87.2 |
| 17891 | 8 | 0141:59 | 88.4 |
| 17904 | 9 | 0903:25 | 63.8 |
| 17918 | 10 | 0908:02 | 64.9 |
| 17932 | 11 | 0912:39 | 66.1 |
| 17946 | 12 | 0917:16 | 67.3 |
| 17960 | 13 | 0921:53 | 68.5 |
| 17974 | 14 | 0926:30 | 69.7 |
| 17988 | 15 | 0931:07 | 70.8 |
| 18002 | 16 | 0935:44 | 72.0 |
| 18016 | 17 | 0940:20 | 73.2 |
| 18030 | 18 | 0944:57 | 74.4 |
| 18044 | 19 | 0949:34 | 75.5 |
| 18058 | 20 | 0954:11 | 76.7 |
| 18072 | 21 | 0958:47 | 77.9 |
| 18086 | 22 | 0103:24 | 79.1 |
| 18100 | 23 | 0108:00 | 80.3 |
| 18114 | 24 | 0112:37 | 81.4 |
| 18128 | 25 | 0117:13 | 82.6 |
| 18142 | 26 | 0121:50 | 83.8 |
| 18156 | 27 | 0126:26 | 85.0 |
| 18170 | 28 | 0131:02 | 86.1 |
| 18184 | 29 | 0135:39 | 87.3 |
| 18198 | 30 | 0140:15 | 88.5 |


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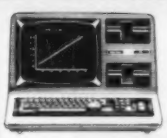

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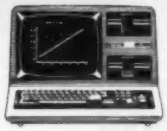

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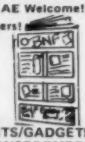

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List price $189.95/**CE price $124.00**

*Frequency range: 33-47, 152-164, 450-508 MHz.*

The incredible, *Bearcat* Four-Six Thin Scan™ is like having an information center in your pocket. This four band, 6 channel crystal controlled scanner has patented Track Tuning on UHF. Scan Delay and Channel Lockout. Measures 2¾ x 6¼ x 1." Includes rubber ducky antenna. Order crystal certificate for each channel. Made in Japan.

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| KU520A | Variable Attenuator 18 to 26.5 GHz | 100.00 |
| 4684-20C | Variable Attenuator 0 to 180dB | 100.00 |
| 6684-20F | Variable Attenuator 0 to 180dB | 100.00 |

### General Microwave

| | |
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### Hewlett Packard

| | | |
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| H487B | 100 ohms Neg. Thermistor Mount (NEW) | 150.00 |
| H487B | 100 ohms Neg. Thermistor Mount (USED) | 100.00 |
| 477B | 200 ohms Neg. Thermistor Mount (USED) | 100.00 |
| X487A | 100 ohms Neg. Thermistor Mount (USED) | 100.00 |
| X487B | 100 ohms Neg. Thermistor Mount (USED) | 125.00 |
| J468A | 100 ohms Neg. Thermistor Mount (USED) | 150.00 |
| 478A | 200 ohms Neg. Thermistor Mount (USED) | 150.00 |
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| X382A | 8.2 to 12.4 GHz Variable Attenuator 0 to 50dB | 250.00 |
| NK292A | Waveguide Adapter | 65.00 |
| 8436A | Bandpass Filter 8 to 12.4 GHz | 75.00 |
| 8471A | RF Detector | 50.00 |
| H532A | 7.05 to 10 GHz Frequency Meter | 300.00 |
| G532A | 3.95 to 5.85 GHz Frequency Meter | 300.00 |
| J532A | 5.85 to 8.2 GHz Frequency Meter | 300.00 |
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| S347A | 2.6 to 3.95 GHz noise source | 600.00 |
| G347A | 3.95 to 5.85 GHz noise source | 500.00 |
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| 11049C | Feed-through termination | 25.00 |
| 10100B | Termination | 25.00 |
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| H421A | 7.05 to 10 GHz matched pair | 200.00 |

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| 4013C-10/ | 22540A Directional Coupler 2 to 4 GHz 10db Type SMA | 90.00 |
| 4014-10/ | 22538 Directional Coupler 3.85 to 8 GHz 10dB Type SMA | 90.00 |
| 4014C-6/ | 22876 Directional Coupler 3.85 to 8 GHz 6dB Type SMA | 90.00 |
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| X101 | 8.2 to 12.4 GHz Variable Attenuator 0 to 60dB | 200.00 |
| C101 | Variable Attenuator 0 to 60dB | 200.00 |
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| 195B | 8.2 to 12.4 GHz Variable Attenuator 0 to 50dB | 100.00 |
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| 196C | 8.2 to 12.4 GHz Variable Attenuator 0 to 45dB | 100.00 |
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| MC6854P | ADLC | 22.00 |
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| MC6862L | 2400 BPS Modem | 14.99 |
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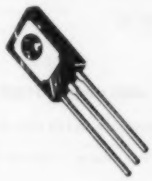

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10.7 MHz Narrow Band Crystal Filter
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### TEST EQUIPMENT — HEWLETT PACKARD — TEKTRONIX — ETC.

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| 614A | 900 to 2100 mc. Signal Generator | 500.00 |
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| 618A | 3.8 to 7.2 Gc Signal Generator | 400.00 |
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| 620A | 7 to 11 Gc Signal Generator | 500.00 |
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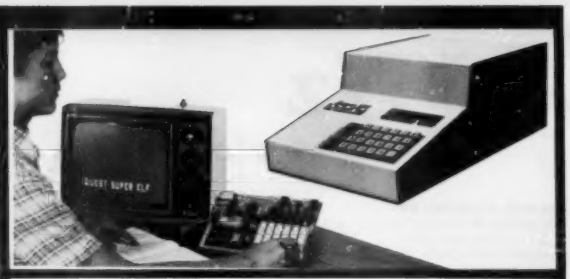

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An RCA 1861 **video graphics** chip allows you to connect to your own TV with an inexpensive video modulator to do graphics and games. There is a **speaker system** included for writing your own music or using many music programs already written. The speaker amplifier may also be used to drive relays for control purposes.

A 24 key **HEX keyboard** includes 16 HEX keys plus **load, reset, run, wait, input, memory protect, monitor select** and **single step**. Large, on board displays provide output and optional **high and low address**. There is a 44 pin standard connector slot for PC cards and a 50 pin connector slot for the Quest Super Expansion Board. Power supply and sockets for **all** IC's are included in the price plus a detailed 127 pg. instruction manual which now includes over 40 pgs. of software info. including a series of lessons to help get you started and a music program and graphics target game. Many schools and universities are using the Super Elf as a course of study. OEM's use it for training and R&D.

Remember, other computers only offer Super Elf features at additional cost or not at all. **Compare before you buy. Super Elf Kit $106.95, High address option $8.95, Low address option $9.95. Custom Cabinet** with drilled and labelled plexiglass front panel **$24.95.** All metal Expansion Cabinet, painted and silk screened, with room for 5 S-100 boards and power supply **$57.00. NiCad Battery Memory Saver Kit $6.95.** All kits and options also completely assembled and tested.

**Questdata**, a software publication for 1802 computer users is available by subscription for $12.00 per 12 issues. Single issues $1.50. Issues 1-12 bound $16.50.

## Free 14 page brochure.

Moews Video Graphics **$3.50.** Games and Music **$3.00.** Chip 8 Interpreter **$5.50.**

## Super Expansion Board with Cassette Interface $89.95

This is truly an astounding value! This board has been designed to allow **you** to decide how you want it optioned. **The Super Expansion Board comes with 4K of low power RAM** fully addressable anywhere in 64K with built-in memory protect and a **cassette interface**. Provisions have been made for all other options on the same board and it fits neatly into the hardwood cabinet alongside the **Super Elf**. The board includes slots for up to 6K of **EPROM** (2708, 2758, 2716 or TI 2716) and is **fully socketed**. EPROM can be used for the monitor and Tiny Basic or other purposes. **A 1K Super ROM Monitor $19.95** is available as an on board option in 2708 EPROM which has been preprogrammed with a program loader/editor and error checking multi file cassette read/write software, (relocatable cassette file) another exclusive from Quest. It includes register save and readout, block move capability and video graphics driver with blinking cursor. Break points can be used with the register save feature to isolate program bugs quickly, then follow with single step. If you have the **Super Expansion Board** and **Super Monitor** the monitor is up and running at the push of a button.

Other on board options include **Parallel Input and Output Ports** with **full handshake**. They allow easy connection of an ASCII keyboard to the input port. **RS 232 and 20 ma Current Loop** for teletype or other device are on board and if you need more memory there are two **S-100** slots for static RAM or video boards. Also a 1K Super Monitor version 2 with video driver for full capability display with Tiny Basic and a video interface board. **Parallel I/O Ports $9.85. RS 232 $4.50. TTY 20 ma I/F $1.95. S-100 $4.50. A 50 pin connector set** with ribbon cable is available at $15.25 for easy connection between the **Super Elf** and the **Super Expansion Board.**

**Power Supply Kit** for the complete system (see Multi-volt Power Supply ).

## Quest Super Basic V5.0

A new enhanced version of **Super Basic** now available. Quest was the first company worldwide to ship a full size Basic for 1802 Systems. A complete function **Super Basic** by **Ron Cenker** including floating point capability with scientific notation (number range ±.17E⁻⁹⁹, 32 bit integer ±2 billion; multi dim arrays, string arrays; string manipulation; cassette I/O; save and load, basic, data and machine language programs; and over 75 statements, functions and operations.

New improved faster version including **renumber** and essentially **unlimited variables.** Also, an exclusive user expandable command library.

Serial and Parallel I/O included.

**Super Basic on Cassette $55.00.**

## Ohio Scientific Computers

CIP Series 2 **$447.00.** Like an Apple at less than half the price! CIPMF Series 2 **$1199.00.** Minifloppy version with additional RAM/ROM. Complete software and peripherals available. Send for free brochure.

## Gremlin Color Video Kit $69.95

32 x 16 alpha/numerics and graphics; up to 8 colors with 6847 chip; 1K RAM at E000. Plugs into Super Elf 44 pin bus. No high res. graphics. On board RF Modulator Kit **$4.95**

## 1802 16K Dynamic RAM Kit $149.00

Expandable to 32K. Hidden refresh w/clocks up to 4 MHz w/no wait states. Addl. 16K RAM **$25.00**

**Tiny Basic Extended on Cassette $15.00 (added commands include Stringy, Array, Cassette I/O etc.) S-100 4-Slot Expansion $ 9.95**

**Super Monitor VI.I Source Listing $15.00**

## Elf II Adapter Kit $24.95

Plugs into Elf II providing Super Elf 44 and 50 pin plus S-100 bus expansion. (With Super Expansion). High and low address displays, state and mode LED's optional **$18.00.**

## Super Color S-100 Video Kit $129.95

Expandable to 256 x 192 high resolution color graphics. 6847 with all display modes computer controlled. Memory mapped. 1K RAM expandable to 6K. S-100 bus 1802, 8080, 8085, Z80 etc.

**Dealers: Send for excellent pricing/margin program.**

**Editor Assembler $25.00 (Requires minimum of 4K for E/A plus user source)**

**1802 Tiny Basic Source listing $19.00**

**Super Monitor V2.0/2.1 Source Listing $20.00**

## PROM Eraser

assembled. 25 PROM capacity **$37.50** (with timer **$69.50**). 6 PROM capacity OSHA/UL version **$69.50** (with timer **$94.50**).

## Z80 Microcomputer

16 bit I/O, 2 MHz clock, 2K RAM, ROM Breadboard space. Excellent for control. Bare Board **$28.50.** Full Kit **$99.00.** Monitor **$20.00.** Power Supply Kit **$35.00. Tiny Basic $30.00**

## S-100 Computer Boards

| | |
|---|---|
| 8K Static Godbout Econo IIA Kit | 149.00 |
| 16K Static Godbout Econo XIV Kit | 269.00 |
| 24K Static Godbout Econo XX-24 Kit | 414.00 |
| 32K Static Godbout Econo XX-32 Kit | 537.00 |
| 16K Dynamic RAM Kit | 289.00 |
| 32K Dynamic RAM Kit | 328.00 |
| 64K Dynamic RAM Kit | 399.00 |
| Video Interface Kit | **$161.00** |
| Color Video Kit | 129.95 |

## 81 IC Update Master Manual $79.95

Comp. IC data selector, 2 vol. master reference guide. Over 51,000 cross references. Free update service through 1981. Domestic postage $4.75.

## Modem Kit $60.00

State of the art, orig., answer. No tuning necessary. 103 compatible 300 baud. Inexpensive acoustic coupler plans included. Bd. only $17.00. Article in May *Radio Electronics*.

## LRC 7000 + Printer $389.00

64/40/32/20 column dot matrix impact, std. paper. Interface all personal computers.

**LRC 7000 printer interface cable for Super Elf with software $35.00**

## NiCad Battery Fixer/Charger Kit

Opens shorted cells that won't hold a charge and then charges them up, all in one kit w/full parts and instructions. **$9.95**

## Rockwell AIM 65 Computer

6502 based single board with full ASCII keyboard and 20 column thermal printer. 20 char. alphanumeric display, ROM monitor, fully expandable. **$405.00.** 4K version **$450.00.** 4K Assembler **$85.00.** 8K Basic Interpreter **$100.00.**

Special small power supply for AIM65 assem. in frame **$54.00.** Complete AIM65 in thin briefcase with power supply **$499.00.** Molded plastic enclosure to fit both AIM65 and power supply **$47.50.** Special Package Price: 4K AIM, 8K Basic, power supply, cabinet **$825.00.**

AIM65/KIM/VIM/Super Elf 44 pin expansion board; 3 female and 1 male bus. Board plus 3 connectors **$22.95.**

## 60 Hz Crystal Time Base Kit $4.40

Converts digital clocks from AC line frequency to crystal time base. Outstanding accuracy.

## Video Modulator Kit $9.95

Convert TV set into a high quality monitor w/o affecting usage. Comp. kit w/full instruc.

## Multi-volt Computer Power Supply

8v 5 amp, ±18v .5 amp, 5v 1.5 amp, −5v .5 amp, 12v .5 amp, −12v option. ±5v, ±12v are regulated. Basic Kit **$35.95.** Kit with chassis and all hardware **$51.95.** Add $5.00 shipping. Kit of hardware **$16.00.** Woodgrain case **$10.00.** $1.50 shipping.

TERMS: $5.00 min. order U.S. Funds. Calif residents add 6% tax. $10.00 min. BankAmericard and Master Charge accepted. $1.00 insurance optional. Postage: Add 5%. C.O.D. $10.00 min. order.

FREE: Send for your copy of our NEW 1981 QUEST CATALOG. Include 48¢ stamp.

# SEMICONDUCTORS SURPLUS

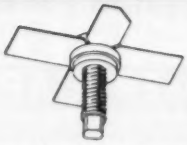
## ARCO CAPS

| | | | | | |
|---|---|---|---|---|---|
| 304 | 100-550pF | 1.50 | 469 | 170-780pF | 1.40 |
| 400 | .9-7pF | 1.00 | 4615 | 390-1400pF | 2.02 |
| 402 | 1.5-20pF | 1.00 | 404 | 8-60pF | 1.00 |
| 420 | 1-12pF | 1.00 | 405 | 10-80pF | 1.00 |
| 423 | 7-100pF | 1.00 | 422 | 4-40pF | 1.00 |
| 426 | 37-250pF | 1.01 | 424 | 16-150pF | 1.00 |
| 464 | 25-280pF | 1.00 | 427 | 55-300pF | 1.00 |
| 465 | 50-380pF | 1.39 | 462 | 5-80pF | 1.50 |
| 467 | 110-580pF | 1.03 | | | |

## TUBES

| | | | |
|---|---|---|---|
| 6KD6 | 5.00 | 6939 | 7.99 |
| 6LQ6/6JE6 | 6.00 | 6146 | 5.00 |
| 6MJ6/6LQ6/6JE6C | 6.00 | 6146A | 5.69 |
| 6LF6/6MH6 | 5.00 | 6146B/8298 | 7.95 |
| 12BY7A | 4.00 | 6146W | 12.00 |
| 2E26 | 4.69 | 6550A | 8.00 |
| 4X150A | 29.99 | 8908 | 9.00 |
| 4CX250B | 45.00 | 8950 | 9.00 |
| 4CX250R | 69.00 | 4-400A | 145.00 |
| 4CX300A | 109.99 | 4-400C | 145.00 |
| 4CX350A/8321 | 100.00 | 572B/T160L | 44.00 |
| 4CX350F/J/8904 | 100.00 | 7289 | 9.95 |
| 4CX1500B/8660 | 300.00 | 3-1000Z | 229.00 |
| 811A | 20.00 | 3-500Z | 141.00 |
| 6360 | 4.69 | | |

## RF Transistors



| | | | | | |
|---|---|---|---|---|---|
| MRF203 | P.O.R. | MRF449 | 12.65 | BFR91 | 1.25 |
| MRF216 | 19.47 | MRF449A | 12.65 | BFR96 | 1.50 |
| MRF221 | 8.73 | MRF450 | 11.00 | BFW92A | 1.00 |
| MRF226 | 10.20 | MRF450A | 11.77 | BFW92 | .79 |
| MRF227 | 2.13 | MRF452 | 15.00 | MMCM918 | 14.30 |
| MRF238 | 10.00 | MRF453 | 13.72 | MMCM2222 | 15.65 |
| MRF240 | 14.62 | MRF454A | 21.83 | MMCM2369 | 15.00 |
| MRF245 | 28.87 | MRF455 | 14.08 | MMCM2484 | 15.25 |
| MRF247 | 28.87 | MRF455A | 14.08 | MMCM3960A | 24.30 |
| MRF262 | 6.25 | MRF474 | 3.00 | MWA120 | 7.80 |
| MRF314 | 12.20 | MRF475 | 2.90 | MWA130 | 8.08 |
| MRF406 | 11.33 | MRF476 | 2.25 | MWA210 | 7.46 |
| MRF412 | 20.65 | MRF477 | 10.00 | MWA220 | 8.08 |
| MRF421 | 27.45 | MRF485 | 3.00 | MWA230 | 8.62 |
| MRF422A | 38.25 | MRF492 | 20.40 | MWA310 | 8.08 |
| MRF422 | 38.25 | MRF502 | .93 | | |
| MRF428 | 38.25 | MRF604 | 2.00 | NEW MRF472 | |
| MRF428A | 38.25 | MRF629 | 3.00 | 12.5 VDC, 27 MHz | |
| MRF426 | 8.87 | MRF648 | 26.87 | 4 Watts output | |
| MRF426A | 8.87 | MRF901 | 3.99 | 10 dB gain | |
| | | MRF902 | 9.41 | 1.69 ea. | |
| | | MRF904 | 3.00 | 10/9.50 | |
| | | MRF911 | 4.29 | 100/69.00 | |
| | | MRF5176 | 11.73 | 1000/480.00 | |
| | | MRF8004 | 1.39 | | |
| | | BFR90 | 1.00 | | |

TO-3 TRANSISTOR SOCKETS
Phenolic type.....6/$1.00

NEW SIMPSON 260-7 $99.99

RG174/U - $15.00 per 100 ft.
Factory new

PL259 TERMINATION
52 Ohm 5 Watts $1.50 each

TORIN TA700 FANS NEW $29.99 each
Model A30340
230 VAC @ .78 Amps
Will also work on 115 VAC

## CRYSTAL FILTERS

| | |
|---|---|
| EFCL455K13E | 3.99 |
| EFCL455K40B2 | 2.99 |
| FX-07800L, 7.8 MHz | 12.99 |
| FHA103-4, 10.7 MHz | 12.99 |

## CB type crystals

$4.95 each

| 51-T | | |
|---|---|---|
| T1 | T15 | T28 |
| T2 | T16 | T29 |
| T3 | T17 | T30 |
| T4 | T18 | T31 |
| T5 | T19 | T32 |
| T6 | T20 | T33 |
| T7 | T21 | T34 |
| T8 | T22 | T35 |
| T9 | T23 | T36 |
| T10 | T24 | T37 |
| T11 | T25 | T38 |
| T12 | T26 | T39 |
| T13 | T27 | T40 |
| T14 | | |

| 51-R | | |
|---|---|---|
| R1 | R15 | R28 |
| R2 | R16 | R29 |
| R3 | R17 | R30 |
| R4 | R18 | R31 |
| R5 | R19 | R32 |
| R6 | R20 | R33 |
| R7 | R21 | R34 |
| R8 | R22 | R35 |
| R9 | R23 | R36 |
| R10 | R24 | R37 |
| R11 | R25 | R38 |
| R12 | R26 | R39 |
| R13 | R27 | R40 |
| R14 | | |

NEW CHERRY BCD SWITCH
New end plates
Type T-20..... 1.29 each

## Johnson AIR Variables

$1.00 each

| | |
|---|---|
| T-3-5 | 1 to 5 pF |
| T-6-5 | 1.7 to 11 pF |
| T-9-5 | 2 to 15 pF |
| 189-6-1 | .1 to 10 pF |
| 189-502-Y | 1.3 to 6.7pF |
| 189-503-105 | 1.4 to 9.2pF |
| 189-504-5 | 1.5 to 11.6pF |
| 189-505-5 | 1.7 to 14.1pF |
| 189-505-107 | 1.7 to 14.1pF |
| 189-506-103 | 1.8 to 16.7pF |
| 189-507-105 | 2 to 19.3pF |
| 189-508-5 | 2.1 to 22.9pF |
| 189-509-5 | 2.4 to 24.5pF |
| 545-043 | 1.8 to 11.4pF |

See List of Advertisers on page 114

## Johnson AIR Variables

1/4 x 2 1/2" shaft
$2.50 each

| | | |
|---|---|---|
| 193-10-6 | 2.2 to | 34 pF |
| 193- | 1.5 to | 27.5pF |
| 193- | .6 to | 6.4pF |

$1.00 each

| | | |
|---|---|---|
| 160-107-16 | .5 to | 12 pF |
| 193-10-9 | 2.2 to | 34 pF |
| 193-10-104 | 2.2 to | 34 pF |
| 193-4-5 | 3 to | 30 pF |

## RF Power Device

MRF454 Same as MRF458
12.5 VDC, 3-30 MHz
80Watts output, 12dB gain
$17.95 ea.

## E.F. JOHNSON TUBE SOCKETS

#124-0311-100..... 6.99 each
For 8072 etc.

#124-0107-001..... 13.99 each
For 4CX250B/R, 4X150A etc.

#124-0111-001..... 4.99 each
Chimney for 4CX250B/R and 4X150

#124-0113-001 and 124-0113-021
$12.99 each
Capacitor for #124-0107-001

#123-209-33 Sockets....6.99 each
For 811A, 572B, 866, etc.

## UNELCO CAPS

| | | |
|---|---|---|
| 6.8pF | 47pF | |
| 8.2pF | 62pF | |
| 10pF | 100pF | |
| 12pF | 160pF | |
| 13pF | 180pF | |
| 14pF | 200pF | |
| 20pF | 240pF | |
| 24pF | 380pF | |
| 33pF | 470pF | |
| 36pF | 1000pF | |
| 43pF | 350V | $1.00 each |

86 Pin Motorola Bus Edge Connectors

Gold plated contacts
Dual 43/86 pin .156 spacing
Solder tail for PCB.....$3.00 each

110VAC MUFFIN FANS

New ..... $11.95
Used ..... $5.95

## Transistors

| | |
|---|---|
| 2N2857JAN | 2.50 |
| 2N2949 | 3.60 |
| 2N2947 | 15.00 |
| 2N2950 | 4.60 |
| 2N3375 | 8.00 |
| 2N3553 | 1.57 |
| 2N3818 | 5.00 |
| 2N3866 | 1.00 |
| 2N3866JAN | 2.50 |
| 2N3866JANTX | 4.00 |
| 2N3925 | 10.00 |
| 2N3948 | 2.00 |
| 2N3950 | 25.00 |
| 2N3959 | 3.00 |
| 2N3960JANTX | 10.00 |
| 2N4072 | 1.60 |
| 2N4427 | 1.10 |
| 2N4429 | 7.00 |
| 2N4877 | 1.00 |
| 2N4959 | 2.00 |
| 2N4976 | 15.00 |
| 2N5070 | 8.00 |
| 2N5071 | 15.00 |
| 2N5108 | 4.00 |
| 2N5109 | 1.50 |
| 2N5179 | 1.00 |
| 2N5583 | 4.00 |
| 2N5589 | 6.00 |
| 2N5590 | 8.00 |
| 2N5591 | 11.00 |
| 2N5635 | 5.44 |
| 2N5636 | 11.60 |
| 2N5637 | 20.00 |
| 2N5641 | 5.00 |
| 2N5643 | 14.00 |
| 2N5645 | 10.00 |
| 2N5842 | 8.00 |
| 2N5849 | 20.00 |
| 2N5942 | 40.00 |
| 2N5946 | 14.00 |
| 2N5862 | 50.00 |
| 2N6080 | 7.00 |
| 2N6081 | 10.00 |
| 2N6082 | 11.00 |
| 2N6083 | 13.00 |
| 2N6084 | 14.00 |
| 2N6095 | 11.00 |
| 2N6096 | 20.00 |
| 2N6097 | 28.00 |
| 2N6166 | 38.00 |
| 2N6368 | 22.99 |
| A210/MRF517 | 2.00 |
| BLY38 | 5.00 |
| 40280/2N4427 | 1.10 |
| 40281/2N3920 | 7.00 |
| 40282/2N3927 | 10.48 |

## CRYSTALS

$4.95 each

| | | | | | | |
|---|---|---|---|---|---|---|
| 5.120 | 7.4825 | 9.565 | 10.150 | 11.155 | 11.905 | 17.315 |
| 7.3435 | 7.4865 | 9.575 | 10.160 | 11.275 | 11.955 | 17.355 |
| 7.4585 | 7.4925 | 9.585 | 10.170 | 11.700 | 12.000 | 17.365 |
| 7.4615 | 7.4985 | 10.000 | 10.180 | 11.705 | 12.050 | 37.600 |
| 7.4625 | 7.5015 | 10.010 | 10.240 | 11.730 | 12.100 | 37.650 |
| 7.4665 | 7.5025 | 10.020 | 10.245 | 11.750 | 16.965 | 37.700 |
| 7.4685 | 7.5065 | 10.030 | 10.595 | 11.755 | 17.015 | 37.750 |
| 7.4715 | 7.7985 | 10.040 | 10.605 | 11.800 | 17.065 | 37.800 |
| 7.4725 | 7.8025 | 10.0525 | 10.615 | 11.850 | 17.165 | 37.850 |
| 7.4765 | 9.545 | 10.130 | 10.625 | 11.855 | 17.215 | 37.900 |
| 7.4785 | 9.555 | 10.140 | 10.635 | 11.900 | 17.265 | 37.950 |
| 7.4815 | | | | | | 38.000 |

## High Voltage Caps

| | |
|---|---|
| 30 MFD @ 500 VDC | 1.69 |
| 22 MFD @ 500 VDC | 1.69 |
| 100 MFD @ 450 VDC | 2.29 |
| 150 MFD @ 450 VDC | 3.29 |
| 225 MFD @ 450 VDC | 4.29 |
| .001/1000pF @ 10 KV | .89 |
| .001 @ 3 KV | 4/1.00 |
| .0015 @ 3 KV | 3/1.00 |
| .01 @ 4 KV | .79 |
| .01 @ 1.6KV | 4/1.00 |
| .02 @ 8 KV | 2.00 |
| .01 @ 1 KV | 6/1.00 |

NEW 2" ROUND SPEAKERS
100 Ohm coil $.99 each

PLASTIC TO-3 SOCKETS
4/$1.00

CRYSTAL FILTERS
Tyco 001-19880 Same as 2194F
10.7 MHz narrow band
3 dB bandwidth 15 KHz min.
20 dB bandwidth 60 KHz min.
40 dB bandwidth 150 KHz min.
Ultimate 50 dB insertion loss 1 dB max.
Ripple 1 dB max. Ct. 0+/-5 pF 3600 Ohms
$3.99 each

78MO5
Same as 7805 but only 1/2 Amp
5 VDC .49 each or 10/$3.00

## TRIMMER CAPS

Sprague. Stable Polypropylene.
.50 each or 10/4.00
not sold mixed
1.2 to 13pF
2 to 30pF
3.9 to 18pF
3.9 to 40pF
3.9 to 55pF

Carbide Circuit Board Drill Bits
for PCB Boards
5 mix for $5.00

## J-Fet

J310 N-CHANNEL J-FET 450 MHz
Good for VHF/UHF Amplifier,
Oscillator and Mixers 3/$1.00

MURATA CERAMIC FILTERS

| | | |
|---|---|---|
| SFD 455D | 455 KHz | 2.00 |
| SFB 455D | 455 KHz | 1.60 |
| CFM455E | 455 KHz | 5.50 |
| CFU455H | 455 KHz | 3.00 |
| SFE 10.7MA | 10.7 MHz | 2.99 |

TEXAS INSTRUMENT TIL-305P
5 x 7 array alphanumeric display
$3.85 each

# SEMICONDUCTORS SURPLUS

## ATLAS FILTERS

ATLAS CRYSTAL FILTERS FOR ATLAS HAM GEAR

Your Choice

$15.95 ea.

5.645 - 2.7/8
5.595 - 2.7 USB
5.595 - 2.7/8/L
5.595 - 2.7 LSB
5.595 - .500/4
9.0 - USB/CW

## Soldering Kit

New Weller Soldering Iron Kit
#SP-23F..... 9.99 each
Kit includes:
- 1 - 25 Watt soldering iron, develops 750° of tip temperature
- 3 - tips (screwdriver, chisel, cone)
- 1 - soldering aid tool
- 1 - coil 60/40 rosin core solder

CERAMIC PLATE CAPS

$1.09 each
#1 type for 3/8 plate cap
#2 type for 5/8 plate cap

## Used NiCads

Used C Nickel Cadmium Batteries
1.8 amp hour
Pack of ten $8.99 per pack

CERAMIC COIL FORMS

$1.99 each

| | |
|---|---|
| #1 | 3/16" x 4/8" |
| #2 | 3/16" x 1/4" |
| #3 | 1/4 " x 3/4" |
| #4 | 3/8 " x 7/8" |
| #5 | 3/8 " x 5/8" |

All of the above have powdered iron cores.

| | |
|---|---|
| #6 | 1/2"x2 3/4" |

NEW BOGNER DOWNCONVERTER
Industrial version.
1 year guarantee..... $225.00
NOT FOR SALE IN ARIZONA

UHF/VHF RF POWER TRANSISTORS
CD2867/2N6439
60 Watts output
Reg. Price ..... $45.77
SALE PRICE..... $19.99

## CHOKES

| | |
|---|---|
| .1-3 uH | 2.99 |
| VIV .15 .15 uH | 2.99 |
| VIV 150 150 uH | 2.99 |
| 5-20 uH | 1.69 |
| Variable coil 10-80 uH | 2.99 |
| Transformer dual 8.8 uH | 1.00 |
| .47 uH | 1.00 ea. or 10/7.50 |
| .68 uH | 1.00 ea. or 10/7.50 |
| 1 uH | 1.00 ea. or 10/7.50 |
| 1.2 uH | 1.00 ea. or 10/7.50 |
| 1.5 uH | 1.00 ea. or 10/7.50 |
| 2.2 uH | 1.00 ea. or 10/7.50 |
| 2.7 uH | 1.00 ea. or 10/7.50 |
| 3.3 uH | 1.00 ea. or 10/7.50 |
| 6.5 uH | 1.00 ea. or 10/7.50 |
| 7.5 uH | 1.00 ea. or 10/7.50 |
| 10 uH | 1.00 ea. or 10/7.50 |
| 15 uH | 1.00 ea. or 10/7.50 |
| 20 uH | 1.00 ea. or 10/7.50 |
| 22 uH | 1.00 ea. or 10/7.50 |
| 33 uH | 1.00 ea. or 10/7.50 |
| 39 uH | 1.00 ea. or 10/7.50 |
| 47 uH | 1.00 ea. or 10/7.50 |
| 50 uH | 2.99 |
| 56 uH | 1.69 |
| 62 uH | 1.00 ea. or 10/7.50 |
| 68 uH | 1.00 ea. or 10/7.50 |
| 100 uH | 2.99 |
| 120 uH | 1.69 |
| 185 uH | 1.00 ea. or 10/7.50 |
| 538 uH | 1.00 ea. or 10/7.50 |
| 680 uH | 1.00 ea. or 10/7.50 |
| 1000 uH | 1.00 ea. or 10/7.50 |
| 1630 uH | 1.50 |
| .1 mH | 2.99 |
| .2 mH | 2.99 |
| .22 mH | 2.99 |
| .27 mH | 2.99 |
| .33 mH | 2.99 |
| .39 mH | 2.99 |
| .240 mH | 2.99 |
| 1.2 mH | 2.99 |
| 1.5 mH | 2.99 |
| 1.65 mH | 2.99 |
| 1.75 mH | 2.99 |
| 1.9 mH | 2.99 |
| 1 mH | 1.69 |
| 1.88 mH | 3.99 |
| 2 mH | 2.99 |
| 2.4 mH | 2.99 |
| 2.5 mH | 1.00 ea. or 10/7.50 |
| 2.7 mH | 2.99 |
| 3.0 mH | 2.99 |
| 3.6 mH | 2.99 |
| 4.3 mH | 2.99 |
| 4.7 mH | 2.99 |
| 5 mH | 2.99 |
| 5.11 mH | 2.99 |
| 6 mH | 2.99 |
| 7.2 mH | 2.99 |
| 8.25 mH | 2.99 |
| 8.28 mH | 2.99 |
| 8.6 mH | 2.99 |
| 10 mH | 2.99 |
| 12 mH | 2.99 |
| 15 mH | 2.99 |
| 17 mH | 2.99 |
| 19.6 mH | 2.99 |
| 20 mH | 2.99 |
| 20.5 mH | 2.99 |
| 22.6 mH | 2.99 |
| 24 mH | 2.99 |
| 27.4 mH | 2.99 |
| 28.7 mH | 2.99 |
| 29.9 mH | 2.99 |
| 30 mH | 2.99 |
| 36 mH | 2.99 |
| 36.5 mH | 2.99 |
| 40 mH | 2.99 |
| 40.2 mH | 2.99 |
| 43 mH | 2.99 |
| 47 mH | 2.99 |
| 50 mH | 2.99 |
| 59 mH | 2.99 |
| 60 mH | 2.99 |
| 71.5 mH | 2.99 |
| 78.7 mH | 2.99 |
| 86 mH | 2.99 |
| 100 mH | 2.99 |
| 120 mH | 2.99 |
| 150 mH | 2.99 |
| 175 mH | 2.99 |
| 200 mH | 2.99 |
| 205 mH | 2.99 |
| 237 mH | 2.99 |
| 240 mH | 2.99 |
| 300 mH | 2.99 |
| 360 mH | 2.99 |
| 390 mH | 2.99 |
| 430 mH | 2.99 |
| 500 mH | 1.50 |
| 600 mH | 2.99 |
| 1000 mH | 2.99 |
| 1.5 Hy | 2.99 |
| 2.0 Hy | 2.99 |
| 2.5 Hy | 2.99 |
| 3.0 Hy | 2.99 |
| 5.0 Hy | 2.99 |
| 10 Hy | 2.99 |

HIGH VOLTAGE CAPS

| | |
|---|---|
| 420 MFD @ 400 VDC | 3.99 each |
| 600 MFD @ 400 VDC | 3.99 each |

New Fairchild Prescaler Chip

95H90DCQM..... 6.50 each
350 MHz prescaler divide by 10/11

See List of Advertisers on page 114

# 1.9-2.5G CONVERTERS

1900 MHz to 2500 MHz DOWNCONVERTERS
Intended for amateur radio use.
Tunable from channel 2 thru 6.
34 dB gain 2.5 to 3 dB noise.
NOT FOR SALE IN ARIZONA
Warranty for 6 months Model HMR 11
Complete Receiver and Power Supply
(does not include coax)..... $225.00

4 foot Yagi antenna only..... $39.99
Downconverter Kit - PCB and parts.. $69.95
Power Supply Kit -
Box, PCB and parts..... $49.99
Downconverter assembled..... $79.99
Power Supply assembled..... $59.99
Complete Kit form .....$109.99
(includes Yagi antenna and instructions)
REPLACEMENT PARTS
MRF901..... $ 3.99
MBD101..... 1.29
.001 Chip Caps ..... 1.00
Power Supply PCB ..... 4.99
Downconverter PCB..... 19.99
Instructions for any separate item .... 10.00

# NEW TRANSFORMERS

| | | Price each |
|---|---|---|
| F-18X | 6.3 VCT @ 6Amps | 6.99 |
| F-46X | 24V @ 1Amp | 5.99 |
| F41X | 25.2VCT @ 2Amps | 6.99 |
| P-8380 | 10VCT @ 3Amps | 7.99 |
| P-8604 | 20VCT @ 1Amp | 4.99 |
| K-32B | 28VCT @ 100 MA | 4.99 |
| E30554 | Dual 17V @ 1Amp | 6.99 |

## DIODES

HEP 170
3.5 A, 1000 PIV
.20 ea., 100 for $15.00

D61005
1.5 A, 1000 PIV
.15 ea., 100 for $12.00

HVK 1153
25 mA, 30,000 PIV
$1.00 ea., 10 for $8.00

Fairchild LEDs
FLV 5007 & 5009 red.
Case type TO-92.
6/$1.00

SCMS 10K
15 mA, 10,000 PIV
$1.69 ea., 10 for $12.50

High-voltage diode EK500
5000 Volts, 50 mA
.99 each

Motorola SCR
TO-92 Case, 0.8 Amp, 30 V.
Igt 0.2 Vgt 0.8.
Same as #N5060.
4/$1.00 or 100/$15.00

Dialco Type 555-2003
LED 5 VDC with built-in resistor.
.69 each

Motorola MA 752 Rectifier
6 Amps, 200 PIV
4/$1.29

NEW BCD SWITCH
8 switch with end plates
Model TSM200-1011 (CDI) $16.87

CONTINUOUS TONE BUZZERS
12VDC..... $2.00 each

EIMAC FINGER STOCK #Y-302
36 in. long x 1/2 in. $4.99 each

MAGNET WIRE
$22.50 per spool

| | | |
|---|---|---|
| #24 | A.W.G. | 9 lb. |
| #26 | A.W.G. | 9 lb. |
| #25 | A.W.G. | 9 lb. |
| #30 | A.W.G. | 8 3/4 lb. |
| #31 | A.W.G. | 6 lb. |

CORES
4/1.00

| | | |
|---|---|---|
| T20-12 | T30-6 | T37-6 |
| T25-6 | T30-12 | T37-10 |
| T30-2 | T37-2 | T44-6 |

CABLE TIES
#/T-18R 100 per bag
mil. spec. #MS-3368S, 4"
Made by Tyton Corp.
$2.50 per bag
100 bags - $20.00

Miniature Ceramic Trimmers
.50 each or 10/$4.00

| | |
|---|---|
| CV31D350 | 2 to 8 pF |
| HM00-4075-03 | 3.5 to 11 pF |
| 300425 | 3.5 to 13 pF |
| E5-25A | 5 to 25 pF |
| | 5.1 to 40 pF |
| | 3.5 to 15 pF |
| | 5.2 to 40 pF |
| | 2.5 to 6 pF |

CERAMIC STAND OFFS

| | | |
|---|---|---|
| #CNP-5 | 3/8 x 5/8" | .29 each |
| | 7/16 x 1 1/4" | .39 each |
| #N54W0112 | 3/8 x 1 1/2" | .49 each |
| #NL523W03-010 | 3/4 x 1 1/4" | .79 each |

CORES AND BEADS

| | | |
|---|---|---|
| #43 | Shield Bead | 4/1.00 |
| #61 | Toroid | 3/1.00 |
| #43 | Balun | 10/1.00 |
| #61 | Balun | 8/1.00 |
| #61 | Balun | 6/1.00 |
| #61 | Balun | 4/1.00 |
| #61 | Beads | 10/1.00 |
| Ferrite Rod 1/4 x 7 1/2 | | 2.99 |
| Ferrite Beads 1/8" long | | 12/1.00 |
| Ferrite Beads 3/8" long | | 6/1.00 |
| Ferrite Beads 1/16" long | | 12/1.00 |

DOOR KNOB CAPS

| | |
|---|---|
| 470 pF @ 15 KV | $3.99 each |
| Dual 500 pF @ 15 KV | 5.99 each |
| 680 pF @ 6 KV | 3.99 each |
| 800 pF @ 15 KV | 3.99 each |
| 2700 pF @ 40 KV | 5.99 each |

TRANSFORMERS
$9.99 each
#2899652-01
26.8 VCT @ 660 MA
21.9 VCT @ 1.1 Amps
$1.99 each
#18000711P
24 V @ 100 MA
$12.99 each
#2099459-00
28 V @ 1.5 Amps
9.6 V @ 9 Amps
16.8 V @ 300 MA

JUMBO LED'S

| | |
|---|---|
| Red | 8/$1.00 |
| Clear | 6/$1.00 |
| Yellow | 6/$1.00 |
| Green | 6/$1.00 |
| Amber | 6/$1.00 |

MEDIUM LED'S

| | |
|---|---|
| Red | 6/$1.00 |
| Green | 6/$1.00 |

NE555V TIMERS
.39 each or 10/$5.00

NEW DUAL COLON LED
.69 each or 10/$5.00

PLATE CHOKES

| | |
|---|---|
| 75 uH | 3.00 |
| .94 mH | 3.99 |

## TRANSISTORS/IC S

Motorola MHW 252 VHF power amplifier.
Frequency range: 144-148 MHz.
Output power: 25W.
Minimum gain: 19.2 dB.
$29.67 each

Motorola MC 1316P.
House no. same as HEP C6073 & EC9814.
2-W audio amplifier.
$1.29 ea., 10 for $9.50

Fairchild 007-03 IC.
ECG no. 707 Chroma demodulator.
$1.29 ea., 10 for $8.50

Motorola rf transistors.
Selection Guide & Cross-Reference Catalog.
43 pgs.
$1.99 each

RCA Triacs.
Type T2310A.
TO-5 Case with heat sinks.
1.6 Amp, 100 VDC, Igt 3mA.
Sensitive gate.
$1.00 each

RCA power transistors.
NPN RCS 258.
Vceo 60 NFE 5mA.
IC 20 Amps Vce 4V.
250 Watts, Ft 2 MHz.
$3.00 each

RCA Triacs.
Type T4121B/40799.
200 VDC 10 Amps.
Stud type.
$3.69 each

RCA Triacs.
Type 40805/T6421D.
30 Amps, 400 VDC.
$5.00 each

Motorola rf amplifier.
544-4001-002, similar to type MHW 401-2.
1.5 Watts output. 440-512 MHz.
15 dB gain min. $19.99 each

**ORDERING INSTRUCTIONS**

Check, money order, or credit cards welcome. (Master Charge and VISA only.) No personal checks or certified personal checks for foreign countries accepted. Money order or cashiers check in U.S. funds only. Letters of credit are not acceptable.

Minimum shipping by UPS is $2.35 with insurance. Please allow extra shipping charges for heavy or long items.

All parts returned due to customer error or decision will be subject to a 15% restock charge. If we are out of an item ordered, we will try to replace it with an equal or better part unless you specify not to, or we will back order the item, or refund your money.

PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE. Prices supersede all previously published. Some items offered are limited to small quantities and are subject to prior sale.

We now have a toll free number, but we ask that it be used for *charge orders only*. If you have any questions please use our other number. We are open from 8:00 a.m. - 5:00 p.m. Monday thru Saturday.

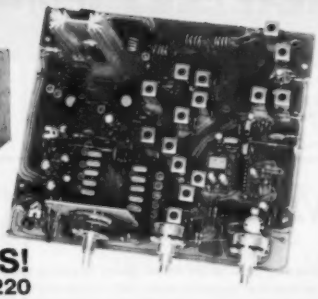
Our toll free number for *charge orders only* is 800-528-3611.

# SEMICONDUCTORS SURPLUS

2822 North 32nd Street, #1 • Phoenix, Arizona 85008 • Phone 602-956-9423

• FM • SSB • CW • ATV • OSCAR
• LINKS • REPEATERS • TRANSMITTERS
• RECEIVERS • PREAMPS • CONVERTERS
• TRANSCEIVERS • POWER SUPPLIES • PA'S

# QUALITY VHF/UHF KITS AT AFFORDABLE PRICES



**Hamtronics® Does it Again!**

**Where else can you get a value-packed radio at such reasonable cost?**

## SAVE A BUNDLE ON VHF FM TRANSCEIVERS!

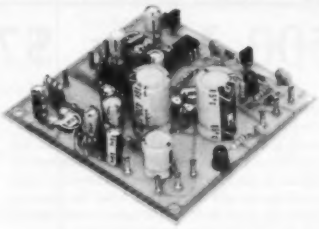
**10 watts, 5 Channels, for 6M, 2M, or 220**

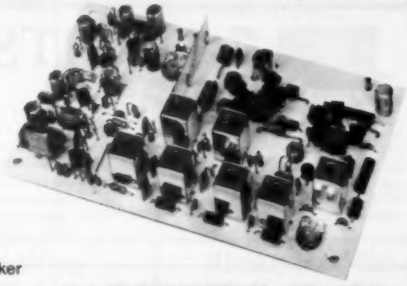
FM-5 PC Board Kit – ONLY $159.95 complete with controls, heatsink, etc.

***Cabinet kit, microphone, crystals, etc. available separately***

***Request catalog for full details.***

## *HIGH QUALITY FM MODULES FOR REPEATERS, LINKS, TELEMETRY, ETC.*





- **R75 VHF FM RECEIVER** for 10M, 6M, 2M, 220, or commercial bands. 4 fantastic selectivity options. Kits from $84.95 to $119.95
- **R450 UHF FM RECEIVER** for 380-520 MHz bands. Kits in selectivity options from $94.95
- **R110 VHF AM RECEIVER** Kit for vhf aircraft band or ham bands. Only $84.95.
- **COR KITS** With audio mixer and speaker amplifier. Only $29.95.
- **CWID KITS** 158 bits, field programmable, clean audio. Only $59.95.
- **A16 RF TIGHT BOX** Deep drawn alum. case with tight cover and no seams. 7 x 8 x 2 inches. Only $18.00.
- **SCANNER CONVERTERS** Copy 72-76, 135-144, 240-270, 400-420, or 806-894 MHz bands on any scanner. Wired/tested Only $79.95.
- **T51 VHF FM EXCITER** for 10M, 6M, 2M, 220 MHz or adjacent bands. 2 Watts continuous. Kits only $54.95.
- **T451 UHF FM EXCITER** for 450 ham band or adjacent. Kits only $64.95.
- **VHF & UHF LINEAR AMPLIFIERS.** Use on either FM or SSB. Power levels from 10 to 45 Watts to go with exciters & xmtg converters. Kits from $69.95.

**VHF & UHF TRANSMITTING CONVERTERS**

For SSB, CW, ATV, FM, etc. Available for 6M, 2M, 220, 440 with many IF input ranges. Converter board kit only at $79.95 (VHF) or $99.95 (UHF) or kits complete with PA and cabinet as shown.

**VHF & UHF RECEIVING CONVERTERS**

20 Models cover every practical rf and if range to listen to SSB, FM, ATV, etc. on 6M, 2M, 220, 440, and 110 aircraft band. Even convert weather down to 2M! Kits from $39.95 and wired units.

**VHF & UHF RECEIVER PREAMPS.** Low noise.

VHF Kits from 27 to 300 MHz. UHF Kits from 300 to 650 MHz. Broadband Kits: 20-650 MHz. Prices start at $14.95 (VHF) and $18.95 (UHF). All preamps and converters have noise figure 2dB or less.

- **Call or Write for FREE CATALOG**
  (Send $2.00 or 5 IRC's for overseas MAILING)
- **Order by phone or mail • Add $2 S & H per order**
  (Electronic answering service evenings & weekends)
  Use VISA, MASTERCARD, Check, or UPS COD.

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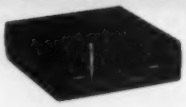
*65-P MOUL RD. • HILTON NY 14468*

*Phone: 716-392-9430*

*Hamtronics® is a registered trademark*

# ramsey the first name in Counters !



## 9 DIGITS 600 MHz $129.95 WIRED

| PRICES: | |
|---|---|
| CT-90 wired, 1 year warranty | $129.95 |
| CT-90 Kit, 90 day parts warranty | 109.95 |
| AC-1 AC adapter | 3.95 |
| BP-1 Nicad pack +AC Adapter/Charger | 12.99 |
| OV-1, Micro-power Oven time base | 49.95 |
| External time base input | 14.95 |

The CT-90 is the most versatile, feature packed counter available for less than $300.00! Advanced design features include; three selectable gate times, nine digits, gate indicator and a unique display hold function which holds the displayed count after the input signal is removed! Also, a 10mHz TCXO time base is used which enables easy zero beat calibration checks against WWV. Optionally; an internal nicad battery pack, external time base input and Micro-power high stability crystal oven time base are available. The CT-90, performance you can count on!

| SPECIFICATIONS: | |
|---|---|
| Range: | 20 Hz to 600 MHz |
| Sensitivity: | Less than 10 MV to 150 MHz<br>Less than 50 MV to 500 MHz |
| Resolution: | 0.1 Hz (10 MHz range)<br>1.0 Hz (60 MHz range)<br>10.0 Hz (600 MHz range) |
| Display: | 9 digits 0.4" LED |
| Time base: | Standard-10.000 mHz, 1.0 ppm 20-40°C.<br>Optional Micro-power oven-0.1 ppm 20-40°C |
| Power: | 8-15 VAC @ 250 ma |

## 7 DIGITS 525 MHz $99.95 WIRED

| SPECIFICATIONS: | |
|---|---|
| Range: | 20 Hz to 525 MHz |
| Sensitivity: | Less than 50 MV to 150 MHz<br>Less than 150 MV to 500 MHz |
| Resolution: | 1.0 Hz (5 MHz range)<br>10.0 Hz (50 MHz range)<br>100.0 Hz (500 MHz range) |
| Display: | 7 digits 0.4" LED |
| Time base: | 1.0 ppm TCXO 20-40°C |
| Power: | 12 VAC @ 250 ma |

The CT-70 breaks the price barrier on lab quality frequency counters. Deluxe features such as; three frequency ranges - each with pre-amplification, dual selectable gate times, and gate activity indication make measurements a snap. The wide frequency range enables you to accurately measure signals from audio thru UHF with 1.0 ppm accuracy - that's .0001%! The CT-70 is the answer to all your measurement needs, in the field, lab or ham shack.

| PRICES: | |
|---|---|
| CT-70 wired, 1 year warranty | $99.95 |
| CT-70 Kit, 90 day parts warranty | 84.95 |
| AC-1 AC adapter | 3.95 |
| BP-1 Nicad pack + AC adapter/charger | 12.95 |

## 7 DIGITS 500 MHz $79.95 WIRED

| PRICES: | |
|---|---|
| MINI-100 wired, 1 year warranty | $79.95 |
| AC-Z Ac adapter for MINI-100 | 3.95 |
| BP-Z Nicad pack and AC adapter/charger | 12.95 |

Here's a handy, general purpose counter that provides most counter functions at an unbelievable price. The MINI-100 doesn't have the full frequency range or input impedance qualities found in higher price units, but for basic RF signal measurements, it can't be beat! Accurate measurements can be made from 1 MHz all the way up to 500 MHz with excellent sensitivity throughout the range, and the two gate times let you select the resolution desired. Add the nicad pack option and the MINI-100 makes an ideal addition to your tool box for "in-the-field" frequency checks and repairs.

| SPECIFICATIONS: | |
|---|---|
| Range: | 1 MHz to 500 MHz |
| Sensitivity: | Less than 25 MV |
| Resolution: | 100 Hz (slow gate)<br>1.0 KHz (fast gate) |
| Display: | 7 digits, 0.4" LED |
| Time base: | 2.0 ppm 20-40°C |
| Power: | 5 VDC @ 200 ma |

## 8 DIGITS 600 MHz $159.95 WIRED

NEW READ RECEIVER FREQUENCY

| SPECIFICATIONS: | |
|---|---|
| Range: | 20 Hz to 600 MHz |
| Sensitivity: | Less than 25 mv to 150 MHz<br>Less than 150 mv to 600 MHz |
| Resolution: | 1.0 Hz (60 MHz range)<br>10.0 Hz (600 MHz range) |
| Display: | 8 digits 0.4" LED |
| Time base: | 2.0 ppm 20-40°C |
| Power: | 110 VAC or 12 VDC |

The CT-50 is a versatile lab bench counter that will measure up to 600 MHz with 8 digit precision. And, one of its best features is the Receive Frequency Adapter, which turns the CT-50 into a digital readout for any receiver. The adapter is easily programmed for any receiver and a simple connection to the receiver's VFO is all that is required for use. Adding the receiver adapter in no way limits the operation of the CT-50, the adapter can be conveniently switched on or off. The CT-50, a counter that can work double-duty!

| PRICES: | |
|---|---|
| CT-50 wired, 1 year warranty | $159.95 |
| CT-50 Kit, 90 day parts warranty | 119.95 |
| RA-1, receiver adapter kit | 14.95 |
| RA-1 wired and pre-programmed (send copy of receiver schematic) | 29.95 |

## DIGITAL MULTIMETER $99.95 WIRED

| PRICES: | |
|---|---|
| DM-700 wired, 1 year warranty | $99.95 |
| DM-700 Kit, 90 day parts warranty | 79.95 |
| AC-1, AC adaptor | 3.95 |
| BP-3, Nicad pack +AC adapter/charger | 19.95 |
| MP-1, Probe kit | 2.95 |

The DM-700 offers professional quality performance at a hobbyist price. Features include; 26 different ranges and 5 functions, all arranged in a convenient, easy to use format. Measurements are displayed on a large 3½ digit, ½ inch LED readout with automatic decimal placement, automatic polarity, overrange indication and overload protection up to 1250 volts on all ranges, making it virtually goof-proof! The DM-700 looks great, a handsome, jet black, rugged ABS case with convenient retractable tilt bail makes it an ideal addition to any shop.

| SPECIFICATIONS: | |
|---|---|
| DC/AC volts: | 100uV to 1 KV, 5 ranges |
| DC/AC current: | 0.1uA to 2.0 Amps, 5 ranges |
| Resistance: | 0.1 ohms to 20 Megohms, 6 ranges |
| Input impedance: | 10 Megohms, DC/AC volts |
| Accuracy: | 0.1% basic DC volts |
| Power: | 4 'C' cells |

### AUDIO SCALER

For high resolution audio measurements, multiplies UP in frequency.

- Great for PL tones
- Multiplies by 10 or 100
- 0.01 Hz resolution!

$29.95 Kit $39.95 Wired

### ACCESSORIES

| | |
|---|---|
| Telescopic whip antenna - BNC plug | $ 7.95 |
| High impedance probe, light loading | 15.95 |
| Low pass probe, for audio measurements | 15.95 |
| Direct probe, general purpose usage | 12.95 |
| Tilt bail, for CT 70, 90, MINI-100 | 3.95 |
| Color burst calibration unit, calibrates counter against color TV signal | 14.95 |

### COUNTER PREAMP

For measuring extremely weak signals from 10 to 1,000 MHz. Small size, powered by plug transformer-included.

- Flat 25 db gain
- BNC Connectors
- Great for sniffing RF with pick-up loop

$34.95 Kit $44.95 Wired

ramsey electronic's, inc.
2575 Baird Rd. Penfield, NY 14526

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CALL 716-586-3950

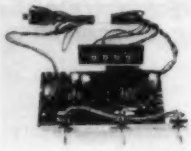
TERMS: Satisfaction guaranteed - examine for 10 days, if not pleased, return in original form for refund. Add $ ... for shipping ... maximum of $10. Overseas add 15%. COD add $2. Orders under $10, add $1.00. NY residents add ... tax.

# DIGITAL RESEARCH: PARTS

## "TOP QUALITY PARTS FOR LESS"

### 9 Watt Stereo Amplifier

***Brand New!***



**6.50**

***Fantastic!***

One of the neatest items we have come up with. Operates on 8 to 20V. A.C. or D.C. (on board diodes).

- Separate tone control pots
- Balance control
- Volume control

Separate inputs for phono, radio, recorder, etc. Separate jack for head phones.

Replace your car stereo amp. Easy hook up — approximately 10 min. with our "how to" instructions.

**Transformer for above — $3.50**

### Universal Timer Kit

**NEW!**

★ Adjustable from 1 sec. to 1 hr.

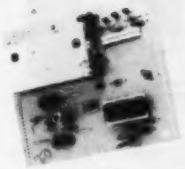
★ Control up to 1 amp *"Turn Things On or Off"*

Kit includes all parts necessary to build this exciting kit.
Uses: Children's T.V. programs - Darkroom exposures - Amateur 10 min. I.D.er - Egg Timer - Intermittent Windshield Wiper. Absolutely endless uses.

Complete kit including power supply, p.c. board - DPDT relay, and all parts to make timer operational.

**8.95**

### Video Game Board



**4.45**

**3 for 12.00**

Hockey • Tennis • Handball

- General Instruments AY3-8500
- Features Exciting Sounds
- On Screen Scoring
- Speed & Paddle Controls
- 1 or 2 Players
- Works on 8-15 Volts D.C.

Each board comes with RF Modulator (Ch. 3 or 4) and schematic. The only parts needed to complete game are speaker, 2-1 Meg Pots & Switches.

### IC Specials!

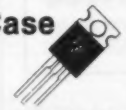
LM1889-2.25
MC1310 - 1.00
LM3820 - A.M. Radio on a chip w/specs. 2/1.00

**16 Pin Header**

4/1.00

### Power Transistor TO220 Case

**3/1.10**



1 Amp 30 Watts 100 Volt
TIP 30C (PNP)
TIP 29C (NPN)

### Gold Wire Wrap Sockets

Not Cheap Gold Inlay as Sold By Others.

Super 3 Level Gold Wire Wrap.

14 Pin - 10/3.95, 25/8.75
16 Pin - 10/4.95, 25/11.25

### Video Paddle Controls

**2 for 1.00**

1 Meg
Can be used with game board above.

### Voltage Regulator

LM309K

**1.00**

5 Volt - 1 Amp Regulator TO3 Case. Super Special!

### Sprague RFI Filter

**3.65 or 3/9.00**

Perfect for Computers, or anything that needs to be "glitch" free. By the #1 name in filtering, Sprague. JN17-5109B. Has I.E.C. Power Line Connector. 2x3 Amp. 115/220 VAC 60 Hz. 2⅛" x 2½" x 3" deep.

### Switch Banks

- Non Canceling
- DPDT-PC or Solder **2.50**
- Switches Easily Removed
- Push On/Push Off

THAT'S INCREDIBLE!

### Transformer

32VCT @ lamp
6V @ lamp **3.25**

Measures:
2" x 2¼" x 2¼"
2⅜" Mounting Centers

### Rectifier Diode

**IN4007**

**11/1.00**

1000 Volts, 1 Amp
DO-41 Case • Prime •
Long Lead • Marked.

### RCA Triac

**79¢**

**5 for 3.50**

T2800M-TO220 Case
6 Amp 600 Volt

### JFET OP AMP

Super High Input Impedance ($10^{12}$ OHMS) — High Frequency Response. TO 4 MHZ. Large DC Voltage Gain 106 DB — New generation OP-AMP with Vastly Superior Features!

LF356BH - 75¢ or 3/2.00

### Micro Mini Toggle Switch

**99¢**

**6 for 5.00**

SPDT • Made in USA with Hardware

***IF YOU DON'T HAVE CATALOG #81-05, YOU BETTER WRITE TODAY!***

TERMS
Add 50¢ postage, we pay balance. Orders under $15 add 75¢ handling. No C.O.D. We accept Visa, MasterCard and American Express cards. Tex. Res. add 5% Tax. Foreign orders (Canada 10%) add 20% P & H

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(312) 848-6777

## NEW RELEASES & POPULAR ITEMS

## IMPROVE YOUR RECEPTION!

### OUR MOST POPULAR PREAMPLIFIER

**MODEL PLF-2**

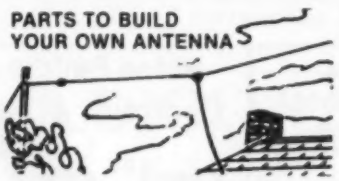
**$52.95**

**AMECO ALL-BAND PREAMP!**

- 6-160 Meters
- 20+ dB Gain
- Low Price

**MODEL PLF-2** . . . Improves weak signals as well as image and spurious rejection of most receivers. Direct switching to rec. or preamp. Includes pwr. supp. 117 VAC wired & tested . . . . . **$52.95**
**MODEL PLF-2E** . . . 240 VAC 50-60 Hz operation . . . . . **$57.95**
**MODEL PT-2** . . . For transceiver use. Continuously tunable from 6 to 160 meters. Features dual-gate FET transistor amplifier for improved receiver sensitivity and low noise figure. Requires no transceiver modifications and can handle up to 250W transceiver output. 117 VAC 60 Hz . . . . . **$79.95**
**MODEL PT-2E** . . . 240 VAC 50-60 Hz operation . . . . . **$84.95**

### PARTS TO BUILD YOUR OWN ANTENNA



**CABLE**

**8U FOAM,** hi dens braid 50 ft. . . . . **$14.95**
**8U FOAM,** hi dens braid 100 ft. . . . . **28.00**
**RG58A/U** stranded center 50 ft. . . . . **6.95**
**RG58A/U** stranded center 100 ft. . . . . **10.95**
**RG58** 3 ft w/PL259 each end. . . . . **3.25**
**RG58** 5 ft w/PL259 each end. . . . . **4.39**
**RG58** 50 ft w/PL259 each end. . . . . **9.85**

**COPPER WIRE**

**#14 stranded,** 100 ft spool. . . . . **6.95**
**#14 solid** copper enameled 100' . . . . . **6.95**

**INSULATORS**

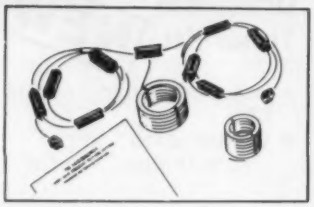
**Egg Ins,** porcelain per pair. . . . . **.99**
**DOG BONE,** porcelain set of 3. . . . . **1.50**
**HY GAIN #155** center insulator. . . . . **5.95**
**HY GAIN** Cycolac end ins per pair. . . . . **3.95**

◆◆◆◆◆◆

### SHIPPING CHARGES
**(Continental USA only)**

All Ameco preamplifiers: **$3.00**
All "Build your own" antenna parts: **$2.00** 1st item; **50c** each additional item.
Eavesdropper Antenna: **$3.00**
Mosley SWV-7: **$5.00**
B&W Portable Whip: **$3.00**
Mini-Reader: **$2.50**

**NOTE:** INTERNATIONAL ORDERS write for Proforma Invoice.



- **AUTOMATIC BANDSWITCHING!**

All the world's shortwave broadcast bands are yours with the Eavesdropper All-Band antenna. Individually tuned traps make the Eavesdropper work like seven separate antennas, each tuned to a different international broadcast band. Also covers 11, and 60M bands as well. Its 100 foot, 72 ohm balanced feedline provides an exact match to the antenna on every band. Comes completely assembled, and ready to install with 50 ft. of 450 lb. test nylon rope. Overall length: 42'10". Wire: #14 copper clad steel. Bandswitching: Automatic. Impedance to rcvr: 50-75 ohms balanced.

**Only $59.95**

## Eavesdropper

### SHORT WAVE BROADCAST RECEIVING ANTENNA

**$59.95**

- COMPLETELY WEATHERPROOF!
- COMPLETE, NO ASSEMBLY NEEDED!
- 60, 49, 41, 31, 25, 19, 16, 13 & 11M BANDS!

### B&W PORTABLE WHIP ANTENNA

**Quick Mounting**

**$34.50**

Simple, dependable whip is designed especially for apartment dwellers and renters who cannot install a permanent antenna. Tunes the 2, 6, 10, 15, 20 and 40-meter Amateur bands. Offers VSWR of 1.1:1 when properly adjusted to operating frequency. Ideal for use as a portable emergency antenna, too. Amounts to almost any horizontal support with a simple clamp bracket.

Weighs less than 2 pounds including five base-loading coils (not used for 6/2 meters), coax line and counterpoise. Whip is 22½" long disassembled, extends to 57". Mount is 14" long. Power rating: 360 watts SSB or CW.

**Model 370-10** . . . . . **$34.50**

NEW!

### Introducing the versatile Kantronics Mini-Reader™

**ONLY**

**$299.95**

**List $319.95**

**Day 2**, including code-speed display, automatic Morse speed tracking, demodulator output, a tuning eye, code-editing programs and a 24-hour clock.

At last, you can have the code-reading functions for Morse, RTTY and ASCII combined in a miniature package. The **Mini-Reader** has all the functions of its larger counterpart, the **Field**

But the **Mini-Reader** measures only 5.74" by 3.5" by 1" and runs on 12 volts! Its calculator size still leaves room for a 10-character, vacuum-tube flourescent display

### 2 METER ANTENNAS at BARGAIN PRICES!!

hy gain

**3 db GAIN MAGNETIC MOUNT**

**ONLY**

**$19.95**

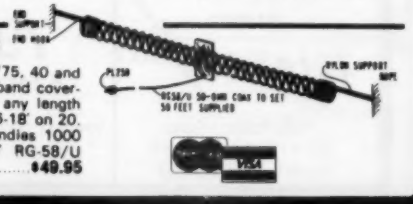
**Model 287**
**Wt. 2.5 lbs.**

An economical alternative to drilling a hole. A magnetic antenna by a name you can trust at a low, low price.

Add $2.00 Shipping

**Model 286** Same but trunk lid. . . . . **$15.95 b**

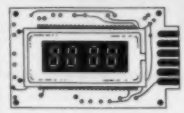
### "SLINKY" Dipole Antenna



A lot of performance in a little space, on 80/75, 40 and 20 meters. Only one setting needed for full band coverage—low VSWR throughout. Can be set at any length from 24-40' on 80/75 meters, 12-35' on 40, 6-18' on 20. Band change takes less than a minute. Handles 1000 watts CW, 2000 PEP on SSB. With 50' RG-58/U coax . . . . . **$49.95**

## National Semiconductor Clock Modules

12VDC AUTOMOTIVE/ INSTRUMENT CLOCK



APPLICATIONS:
- In-dash autoclocks
- After-market auto/ RV clocks
- Aircraft-marine clks.
- 12VDC oper. instru.
- Portable/battery powered instrumnts.

Features: Bright 0.3" green display. Insernal crystal time-base. ±0.5 sec./day accur. Auto. display brightness control logic. Display color filterable to blue, blue-green, green & yellow. Completa—just add switches and lens.

**MA1003 Module . . . . . $16.95**

**CLOCK MODULES**

| | |
|---|---|
| MA1023 .7" Low Cost Digital LED Clock Module | 8.95 |
| MA1026 .7" Dig. LED Alarm Clock/Thermometer | 18.95 |
| MA5036 .3" Low Cost Digital LED Clock/Timer | 6.95 |
| MA1022 .5" LED Display Dig. Clock & Xformer | 9.95 |

**TRANSFORMERS**

| | |
|---|---|
| 102-P20 Xformer for MA1023 Clock Modules | 3.49 |
| 102-P22 Xformer for MA1026 Clock Modules | 3.49 |
| 102-P20 Xformer for MA5036 Clock Modules | 3.49 |

A0201

**8 OHM SPEAKER**

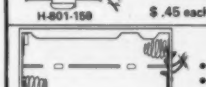
2¼" — 8 Ohm — .25 watt

**$1.25 ea. 2/$1.95 ea. 10/$7.95 ea.**

H-801-150

**BATTERY HOLDER**
- Holds 2 ea. C cells
- Aluminum Case
- 5" leads

**$ .45 each 10/$3.95**

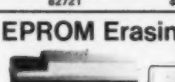


82721

**BATTERY HOLDER**
- Holds 4 ea. C cells
- Plastic case
- 9" leads

**$ .49 ea. 10/$4.25**

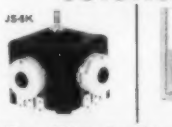
## EPROM Erasing Lamp



- Erases 2708, 2716, 1702A, 5203Q, 5204Q, etc.
- Erases up to 4 chips within 20 minutes.
- Maintains constant exposure distance of one inch.
- Special conductive foam liner eliminates static build-up.
- Built-in safety lock to prevent UV exposure.
- Compact — only 7-5/8" x 2-7/8" x 2"
- Complete with holding tray for 4 chips.

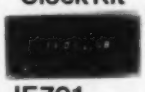
**UVS-11E . . . . . $79.95**

## JOYSTICKS




| | | |
|---|---|---|
| JS-5K | 5K Linear Taper Pots | $5.25 |
| JS-100K | 100K Linear Taper Pots | $4.95 |
| JVC-40 | 40K (2) Video Controller in case | $5.95 |

## 6-Digit Clock Kit



- Bright .300 ht. comm. cathode display
- Uses MM5314 clock chip
- Switches for hours, minutes and hold modes
- Hrs. easily viewable to 20 ft.
- Simulated walnut case
- 115 VAC operation
- 12 or 24 hr. operation
- Incl. all components, case & wall transformer
- Size: 6⅛" x 3-1/8" x 1⅝"

**JE701 . . . . . $19.95**

## NEW! JE215 Adjustable Dual Power Supply

General Description: The JE215 is a Dual Power Supply with independent adjustable positive and negative output voltages. A separate adjustment for each of the supplies provides the user unlimited applications for IC current voltage requirements. The supply can also be used as a general-purpose variable power supply.

FEATURES:
- Adjustable regulated power supplies, pos. and neg. 1.2VDC to 15VDC
- Power Output (each supply): 5VDC @ 500mA, 10VDC @ 750mA, 12VDC @ 500mA, and 15VDC @ 175mA.
- Two, 3-terminal adj. IC regulators with thermal overload protection.
- Heat sink regulator cooling
- LED "on" indicator
- Printed Board Construction
- 120VAC input
- Size: 3-1/2" w x 5-1/16" L x 2" H

**JE215 Adj. Dual Power Supply Kit (as shown) . . $24.95**

(Picture not shown but similar in construction to above)

| | |
|---|---|
| JE200 Reg. Power Supply Kit (5VDC, 1 amp) . . | $14.95 |
| JE205 Adapter Brd. (to JE200) ±5, ±9 & ±12V. | $12.95 |
| JE210 Var. Pwr. Sply. Kit, 5-15VDC, to 1.5amp. | $19.95 |

## MICROPROCESSOR COMPONENTS

**8080A/8080A SUPPORT DEVICES**

| | | |
|---|---|---|
| INS8080A | CPU | 5.95 |
| DP8212 | 8-Bit Input/Output | 3.25 |
| DP8214 | Priority Interrupt Control | 7.95 |
| DP8216 | Bi-Directional Bus Driver | 3.49 |
| DP8224 | Clock Generator/Driver | 3.95 |
| DP8226 | Bus Driver | 3.49 |
| DP8228 | System Controller/Bus Driver | 4.95 |
| DP8238 | System Controller | 5.95 |
| INS8060 | I/O Expander for 48 Series | 9.95 |
| INS8250 | Asynchronous Comm. Element | 14.95 |
| DP8251 | Prog. Comm. I/O (USART) | 7.95 |
| DP8255 | Prog. Peripheral I/O | 34.95 |
| DP8255 | Prog. Peripheral I/O (PPI) | 9.95 |
| DP8257 | Prog. DMA Control | 24.95 |
| DP8259 | Prog. Interrupt Control | 24.95 |
| DP8275 | Prog. CRT Controller | 49.95 |
| DP8279 | Prog. Keyboard/Display Interface | 19.95 |
| DP8286 | Octal Bus Receiver | 3.95 |
| DP8303 | System Timing Element | 6.95 |
| DP8304 | 8-Bit Bi-Directional Receiver | 3.95 |
| DP8307 | 8-Bit Bi-Directional Receiver | 3.95 |
| DP8308 | 8-Bit Bi-Directional Receiver | 3.95 |

**6800/6802 SUPPORT DEVICES**

| | | |
|---|---|---|
| MC6800 | MPU | 24.95 |
| MC6802P | MPU with Clock and RAM | 32.95 |
| MC6810AP1 | 128x8 Static RAM | 4.95 |
| MC6821 | Peripheral Inter. Adapt (MC6820) | 7.49 |
| MC6828 | Priority Interrupt Controller | 22.95 |
| MC6830L8 | 1024x8-Bit ROM (MC6834-8) | 34.95 |
| MC6850 | Asynchronous Comm. Adapter | 6.95 |
| MC6852 | Synchronous Serial Data Adapter | 9.95 |
| MC6860 | 0-600bps Digital MODEM | 39.95 |
| MC6862 | 2400bps Modulator | 12.95 |
| MC6880A | Quad 3-State Bus Trans. (MC8T26) | 2.25 |

**MICROPROCESSOR CHIPS**

| | | |
|---|---|---|
| Z80 (780C) | CPU (MK3880N) (2MHz) | 13.95 |
| Z80A (780-1) | CPU (MK3880N-4) (4MHz) | 19.95 |
| COP380 | CPU | 5.95 |
| 380 | MPU | 19.95 |
| IDM3881/ADC | CPU—4-Bit Slice (Com, Temp, Grade) | 39.95 |
| MC5880 | MPU w/Clock (88 Bytes Memory) | 11.95 |
| INS8624N-4 | MPU—8-Bit (6MHz) | 15.95 |
| INS8289N-4 | CPU—Sgl. Chip 8-Bit (128bytes RAM) | 19.95 |
| INS8406N-4 | CPU (256 Bytes RAM) | 24.95 |
| INS8470N | CPU—64 Bytes RAM | 24.95 |
| INS8073N | CPU w/Basic Micro Interpretor | 29.95 |
| P8085 | CPU | 19.95 |
| INS8900 | CPU—16-Bit | 29.95 |
| TMS9900JL | MPU—16-Bit | 49.95 |

**SHIFT REGISTERS**

| | | |
|---|---|---|
| MM5004 | Dual 25-Bit Dynamic | .59 |
| MM5024 | Dual 50-Bit Dynamic | .59 |
| MM5044 | Dual 100-Bit Static | .59 |
| MM5064 | Dual 64-Bit Accumulator | .95 |
| MM1402 | 256-Bit Dynamic | 1.95 |
| MM5013 | 1024-Bit Dynamic/Accumulator | 1.95 |
| MM5006N | 500/512-Bit Dynamic | .95 |
| MM5009N | Octal 60-Bit | 5.95 |
| MM5026N | Octal 80-Bit | 5.95 |
| 2504V (3804) | 1024-Bit Dynamic | 3.95 |
| 2518N | Hex 32-Bit Static | 4.95 |
| 2522V | Dual 120-Bit Static | 2.95 |
| 2525V | 512-Bit Dynamic | .99 |
| 2535V | 1024-Bit Dynamic | 2.95 |
| 2537V | Dual 256-Bit Static | 3.95 |
| 2538V | Dual 200-Bit Static | 4.95 |
| 2539V | Dual 240-Bit Static | 4.95 |
| 2540V | Quad 80-Bit Static | 5.95 |
| 2901PC | Fifo (Dual 80) | 6.95 |

**DATA ACQUISITION**

| | | |
|---|---|---|
| AF100-1CN | Universal Active Filter 2.5% | 5.95 |
| AF120-1CJ | Touch Tone Low Pass Filter | 19.95 |
| AF130-1CJ | Touch Tone Low Pass Filter | 19.95 |
| LM324AH | Super Gain Op Amp | 1.69 |
| LM334Z | Constant Current Source | 1.25 |
| LM335Z | Temperature Transducer | 1.49 |
| LF356N | JFET Input Op Amp | 1.10 |
| LF398N | Sample & Hold Amplifiers | 3.95 |
| LM399H | Temp. Comp. Prec. Ref. (.5ppm/C°) | 14.95 |
| ADC08MLCN | 8-Bit A/D Converter (1 LSB) | 4.95 |
| DAC0808LCN | 8-Bit D/A Converter (0.19% Lin.) | 3.25 |

**DATA ACQUISITION (CONTINUED)**

| | | |
|---|---|---|
| ADC0808CCN | 8-Bit A/D Converter (8-Ch. Multi.) | 5.95 |
| ADC0817CCN | 8-Bit A/D Converter (16-Ch. Multi.) | 16.95 |
| DAC1020LCN | 10-Bit D/A Conv. Micro. Comp. (0.05%) | 13.95 |
| DAC1020LCN | 10-Bit D/A Conv. Micro. Comp. (0.10%) | 9.95 |
| DAC1020LCN | 10-Bit D/A Converter (0.05% Lin.) | 9.49 |
| DAC1020LCN | 10-Bit D/A Converter (0.20% Lin.) | 5.95 |
| DAC1020LCN | 10-Bit D/A Converter (0.39% Lin.) | 3.95 |
| CD4866N | 8-Channel Multiplexer | 1.10 |
| AY-5-5613 | 30K BAUD UART | 6.95 |

**RAM'S**

| | | |
|---|---|---|
| 1103 | 256x1 Static | 1.49 |
| 2102 | 1024x1 Dynamic | .79 |
| 2106 (2102) | 256x4 Static | 2.95 |
| 2102 | 1024x1 Static | 1.75 |
| 2114A | 1024x4 Static | 3.95 |
| 2111 (8112) | 256x4 Static | 3.95 |
| 2112 | 256x4 Static MOS | 4.95 |
| 2128 | 128x8 Static 450ns | 5.95 |
| 2124L | 1024x4 Static 450ns Low Power | 5.95 |
| 2124-3 | 1024x4 Static 300ns | 7.49 |
| 2124L-3 | 1024x4 Static 300ns Low Power | 7.95 |
| 2117 | 16,384x1 Dynamic 350ns (house marked) | 4.95 |
| 4116H-4 (UPD416) | 16K Dynamic 200ns (MM5290-4) | 3.95 |
| 4164 | 64K Dynamic 200ns | 6.49 |
| MM52H11 | 4096x1 Fast 16ns | 19.95 |
| 5101 | 256x4 Static | 7.95 |
| MM5261 | 1024x1 Dynamic Fully Decoded | .99 |
| MM5222 | 2Kx1 Dynamic | .99 |
| MM5290/4027 | 16Kx1 Dynamic | 4.95 |
| MM5290N-2 (4135) | 16K Dynamic 150ns (UPD416C-3) | 4.95 |
| MM5262-3A | 8K Dyn. 350ns (lower b of MM5262) | 4.95 |
| MM5290N-AA/N | Controller Oriented Processor | 9.95 |
| UPD444/MM5827 | 4K Dynamic 35-pin | 6.95 |
| TMS4044-45NL | 4K Static | 14.95 |
| TMS4045 | 1024x4 Static | 14.95 |

**PROMS/EPROMS**

| | | |
|---|---|---|
| 1702A | 2K UV Erasable PROM | 5.95 |
| 2708 | 8K EPROM | 5.95 |
| TMS2708 | 8K EPROM (5V, +5V, +12V) | 19.95 |
| 2716 (5V) (2716) T1 | 16K EPROM (Single +5V) | 19.95 |
| 2732 (5V) (2732) T1 | 32K EPROM | 39.95 |
| 2758 | 8K EPROM (450ns) (Single +5V) | 7.95 |
| 5262 | 1Kx8 PROM | 14.95 |
| 82S23 (MS 1603) | 32x8 PROM (Open Collector) | 6.95 |
| 82S123 | 32x8 Bipolar PROM | 10.95 |
| 82S123 (MS 1623) | 32x8 Tri-State Bipolar PROM | 6.95 |
| 82S185 | 8K PROM | 29.95 |

**ROM'S**

| | | |
|---|---|---|
| 2513 (2340) | Character Generator (Upper Case) | 9.95 |
| 2513 (2332) | Character Generator (Lower Case) | 9.95 |
| 2533N | Character Generator | 22.95 |
| MM5230N | 256x8-Bit Read Only Memory | 1.95 |

**NMOS READ ONLY MEMORIES**

| | | |
|---|---|---|
| MCM6670P | 128x7 ASCII Shifted w/Greek | 13.95 |
| MCM6676P | 128x7 Math Symbol & Pictures | 13.95 |
| MCM6678P | 128x7 Alpha, Control Char. Gen. | 13.95 |

**MICROPROCESSOR MANUALS**

| | | |
|---|---|---|
| M-700 | User Manual | 7.50 |
| M-COP380 | User Manual | 7.50 |
| M-3880 | User Manual | 5.95 |

**SPECIAL FUNCTION**

| | | |
|---|---|---|
| DS8880CN | Dual MOS Clock Driver (SMZ) | 3.50 |
| DS8882CN | Dual MOS Clock Driver (SMZ) | 3.95 |
| INS1771N-1 | Floppy Disc Controller | 24.95 |
| INS8250N | Communication Chip | 19.95 |
| MM5163N | Microprocessor Real Time Clock | 9.95 |
| MM5837N | Microprocessor Compatible Clock | 11.95 |
| COP468N | Microcontroller with 64-Digit RAM & Direct LED Drive | 6.95 |
| COP495N | Microcontroller with 96-Digit RAM & Direct LED Drive w/4 Bus Int. | 7.49 |
| COP478N | 32-Seg. VAC Fluor. Driver (28-pin pkg.) | 3.25 |

**TELEPHONE/KEYBOARD CHIPS**

| | | |
|---|---|---|
| AY-5-9100 | Push Button Telephone Dialer | 14.95 |
| AY-5-9200 | Repertory Dialer | 34.95 |
| AY-5-9400 | CMOS Clock Generator | 4.95 |
| AY-5-9366 | Keyboard Encoder (88 keys) | 11.95 |
| HD6602-5 | Keyboard Encoder (56 keys) | 7.95 |
| MC903 | Keyboard Encoder (53 keys) | 5.49 |
| MC903 | Keyboard Encoder (89 keys) | 5.95 |
| MM5232BN | Push Button Pulse Dialer | 7.95 |
| MM5740NN | 66/84-Key Serial Keyboard Encoder | 8.95 |

## ELECTRONIC TOY MOTORS

.937 O.D. X 1.201 Length

| Typical Power Source | Operating Voltage Range | TYPICAL CHARACTERISTICS NO LOAD Voltage | NO LOAD Speed RPM | NO LOAD Current AMP | AT MAXIMUM EFFICIENCY Speed RPM | AT MAXIMUM EFFICIENCY Current AMP | AT MAXIMUM EFFICIENCY Torque OZ. IN. | AT MAXIMUM EFFICIENCY Output W | AT MAXIMUM EFFICIENCY Eff. % | SMALL TORQUE OZ. IN. |
|---|---|---|---|---|---|---|---|---|---|---|
| DRY CELL | 1.5-6.0 | 3.0 | 9,200 | 0.20 | 6,750 | 0.90 | 0.260 | 1.30 | 57.0 | 0.97 |

**MABUCHI RE280 $ .99 each . . . 10/$7.50 . . . 100/$50.00**

## GLOBAL SPECIALTIES

### EXPERIMENTOR SOCKETS

| Model | Length | Width | Center Channel | # Tie Point Terminals | Bus Strips | Price |
|---|---|---|---|---|---|---|
| EXP48 | 6.0" | 1.8" | n/a | n/a | 4(100) | $ 4.75 |
| EXP300 | 6.0" | 2.1" | .3" | 94(470) | 2(80) | $12.95 |
| EXP325 | 1.8" | 2.1" | .3" | 22(110) | 2(20) | $ 3.50 |
| EXP330 | 3.6" | 2.1" | .3" | 48(230) | 2(40) | $ 6.75 |
| EXP900 | 6.0" | 2.4" | .6" | 94(470) | 2(80) | $14.75 |
| EXP950 | 3.6" | 2.4" | .6" | 46(230) | 2(40) | $ 8.75 |

### Quick Test Sockets & Bus Strips

| | Length | Width | Terminals | Price |
|---|---|---|---|---|
| GT-100 | 6.0" | 2.4" | 110 | $12.95 |
| GT-500 | 6.0" | 2.1" | 70 | $ 8.75 |
| GT-475 | 5.0" | 2.0" | 94 | $ 9.75 |
| GT-470 | 5.0" | 2.0" | 94 | $ 9.75 |
| GT-355 | 4.1" | 2.0" | 70 | $ 7.25 |
| GT-350 | 4.1" | 2.0" | 70 | $ 7.25 |
| GT-125 | 2.0" | 2.1" | 24 | $ 3.75 |
| GT-105 | 1.8" | 2.1" | 24 | $ 3.75 |
| GT-85 | 1.6" | 1.7" | 16 | $ 2.95 |
| GT-75 | 1.3" | 1.6" | 14 | $ 2.75 |

$10.00 Min. Order — U.S. Funds Only
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PRICES SUBJECT TO CHANGE

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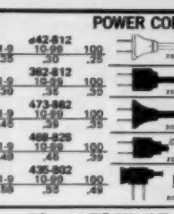
✓38

## POWER CORD SALE

| | | | |
|---|---|---|---|
| #42-812 | | | |
| 1-9 | 10-99 | 100 | |
| .35 | .30 | .25 | |
| 382-812 | | | |
| 1-9 | 10-99 | 100 | |
| .99 | .59 | .59 | |
| 473-862 | | | |
| 1-9 | 10-99 | 100 | |
| .45 | .39 | .35 | |
| 468-825 | | | |
| 1-9 | 10-99 | 100 | |
| .49 | .45 | .39 | |
| 435-802 | | | |
| 1-9 | 10-99 | 100 | |
| .99 | .59 | .49 | |



## AC and DC Wall Transformers

Used for use with clocks, radios, power supplies or any other type of AC or DC equipment.

| Part No. | Input | Output | Price |
|---|---|---|---|
| AC 250 | 117V/60Hz | 12 VAC 250mA | $3.95 |
| AC 500 | 117V/60Hz | 12 VAC 500mA | $4.95 |
| AC1000 | 117V/60Hz | 12 VAC 1 amp | $5.95 |
| AC1700 | 117V/60Hz | 9 VAC 1.7 amp | $6.95 |
| DV 9200 | 117V/60Hz | 9 VDC 200mA | $3.25 |
| DC 900 | 120V/60Hz | 9VDC 500mA | $3.95 |

## CONNECTORS

| | | |
|---|---|---|
| DB25P | D-Subminiature Plug | $2.95 |
| DB25S | D-Subminiature Socket | $3.50 |
| DB51226 | Cover for DB25P/S | $1.75 |
| 22/44SE | P.C. Edge (22/44 Pin) | $2.95 |
| UG88/U | BNC Plug | $1.79 |
| UG99/U | BNC Jack | $3.79 |
| UG175/U | UHF Adapter | $ .49 |
| SO239 | UHF Panel Recp. | $1.29 |
| PL258 | UHF Adapter | $1.80 |
| PL259 | UHF Plug | $1.80 |
| UG260/U | BNC Plug | $1.79 |
| UG1094/U | BNC Bulkhead Recp. | $1.29 |

## TRS-80 16K Conversion Kit

Expand your 4K TRS-80 System to 16K.
Kit comes complete with:
- 8 ea. MM5290 (UPD416/4116) 16K Dyn. Rams (*NS)
- Documentation for Conversion

| | |
|---|---|
| TRS-16K2 *150 NS | $39.95 |
| TRS-16K4 *250 NS | $29.95 |

## JE610 ASCII Encoded Keyboard Kit

The JE610 ASCII Keyboard Kit can be interfaced into most any computer system. The kit comes complete with an industrial grade keyboard switch assembly (62-keys), IC's, sockets, connector, electronic components and a double-sided printed wiring board. The keyboard assembly requires +5V @ 150mA and −12V @ 10 mA for operation. Features: 60 keys generate the 126 characters, upper and lower case ASCII set. Fully buffered. Two user-define keys provided for custom applications. Caps lock for upper-case-only alpha characters. Utilizes a 2376 (40-pin) encoder read-only memory chip. Outputs directly compatible with TTL/DTL or MOS logic arrays. Easy interfacing with a 16-pin dip or 18-pin edge connector. Size: 3⅝"H x 14½"W x 8⅛"D

| | |
|---|---|
| JE610/DTE-AK (After assembled as pictured above) | $124.95 |
| JE610 Kit 62-Key Keyboard, PC Board, & Components (no case) | $ 79.95 |
| K62 62-Key Keyboard (Keyboard only) | $ 34.95 |
| DTE-AK (case only — 3⅜"Hx11"Wx8⅛"D) | $ 49.95 |

NEW! JE212 — Negative 12VDC Adapter Board Kit for JE610 ASCII KEYBOARD KIT Kit/ Provides -12VDC from incoming 5VDC . . $9.95

## JE600 Hexadecimal Encoder Kit

FULL 8-BIT LATCHED OUTPUT
19-KEY KEYBOARD

The JE600 Encoder Keyboard Kit provides two separate hexadecimal digits produced from sequential key entries to allow direct programming for 8-bit microprocessor or 8-bit memory circuits. Three additional keys are provided for user operations with one having a bistable output available. The outputs are latched and monitored with 9 LED readouts. Also included is a key entry strobe. Features: Full 8-bit latched output for microprocessor use. Three user-define keys with one being bistable operation. Debounce circuit provided for all 19 keys. 9 LED readouts to verify entries. Easy interfacing with standard 16-pin IC connector. Only +5VDC required for operation. Size: 3½"H x 6¾"W x 8¾"D

| | |
|---|---|
| JE600/DTE-HK (After assembled as pictured above) | $99.95 |
| JE600 Kit 19-Key Hexadec. Keyboard, PC Board & Cmpnts. (no case) | $59.95 |
| K19 19-Key Keyboard (Keyboard only) | $14.95 |
| DTE-HK (case only — 3⅜"Hx8⅛"Wx8⅛"D) | $44.95 |

✓See List of Advertisers on page 114

# DEALER DIRECTORY

### Phoenix AZ

The Southwest's most progressive communications company stocking Kenwood, ICOM, Yaesu, MFJ, B&W, Astron, Larsen, Cushcraft, Hy-Gain, Bearcat, and more. Would like to serve you! **Power Communications Corp.**, 1640 West Camelback Rd., Phoenix AZ 85015, 241-Watt.

### Culver City CA

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### Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. **Fontana Electronics**, 8888 Sierra Ave., Fontana CA 92335, 822-7710.

### San Jose CA
### SAN FRANCISCO BAY AREA

Homebrewers' haven; tons of new and used Ham/Computer gear and components. Serving Hams since 1938. We specialize in ICOM, KLM, Mirage, Comptronix. We ship worldwide. **Tele-Com Electronics**, 1354-60 Union Avenue, San Jose CA 95124, 377-4479.

### San Jose CA

Bay area's newest Amateur Radio store. New & used Amateur Radio sales & service. We feature Kenwood, ICOM, Anden, Yaesu, Ten-Tec, Santec & many more. **Shaver Radio, Inc.**, 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.

### Aurora CO

Electronic parts, surplus, used ham gear and test equipment, catering to radio amateurs, electronic hobbyists and small manufacturers. Low prices, growing selection. Come see us! **Electronic Bits 'n Pieces, Inc.**, 9717 E. Colfax, Aurora CO 80010, 361-0530.

### Denver CO

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Corp.**, 2630 W. 44th Ave., Denver CO 80211, 458-3444.

### Columbus GA

KENWOOD—YAESU—DRAKE

The world's most fantastic amateur showroom! You gotta see it to believe it! **Radio Wholesale**, 2912 Auburn Avenue, Columbus GA 31906, 561-7000.

### Smyrna GA

For your Kenwood, Yaesu, ICOM, Drake and other amateur needs, come to see us: **Britt's Two-Way Radio**, 2568 N. Atlanta Rd., Smyrna GA 30080, 433-9006.

### Preston ID

Ross WB7BYZ, has the Largest Stock of Amateur Gear in the Intermountain West and the Best Prices. Call me for all your ham needs. **Ross Distributing**, 78 So. State, Preston ID 83263, 852-0650.

### Terre Haute IN

Your ham headquarters located in the heart of the midwest. **Hoosier Electronics, Inc.**, #9 Meadows Center, P.O. Box 3300, Terre Haute IN 47803, 238-1456.

### Littleton MA

The ham store of N.E. you can rely on. Kenwood, ICOM, Wilson, Yaesu, DenTron, KLM amps, B&W switches & wattmeters, Whistler radar detectors, Bearcat, Regency, antennas by Larsen, Wilson, Hustler, CAM. **TEL-COM Inc. Communications & Electronics**, 675 Great Rd., Rt. 119, Littleton MA 01460, 486-3040.

### Medford MA

New England's Distributor and Authorized Service Center for all Major Amateur Lines. Located just North of Boston at Exit 5 on I-93. **Tufts Radio Electronics, Inc.**, 386 Mystic Ave., Medford MA 02155, 391-3900.

### Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, Dentron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGE, WB8UXO, WD8OKN and W8RP behind the counter. **Purchase Radio Supply**, 327 E. Hoover Ave., Ann Arbor, Michigan 48104, 668-8666.

### St. Louis MO

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics Corp.**, 8123-25 Page Blvd., St. Louis MO 63130, 427-6116.

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Waveguide & coaxial microwave components & equipment. Laboratory grade test instruments, power supplies. Buy, sell & trade all popular makes, HP, GR, PRR, ESI, Sorensen, Singer, etc. **Lectronic Research Labs.**, 1433 Ferry Ave., Camden NJ 08104, 541-4200.

### Somerset NJ

New Jersey's only factory-authorized ICOM and YAESU distributor. Large inventory of new and used specials. Most major brands in stock. Complete service and facilities. **Radios Unlimited**, 1760 Easton Avenue, P.O. Box 347, Somerset NJ 08873, 469-4500.

### Amsterdam NY
### UPSTATE NEW YORK

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Featuring: Kenwood, Yaesu, ICOM, Drake, Ten-Tec, Swan, DenTron, Alpha, Robot, MFJ, Tempo, Astron, KLM, Hy Gain, Mosley, Larsen, Cushcraft, Hustler, Mini Products. You won't be disappointed with equipment/service. **Radio World, Oneida County Airport-Terminal Building, Oriskany NY 13424, 337-0203.**

### Columbus OH

All major brands featured in the biggest and best ham store for miles around. Come in and twist the knobs before you buy. **Universal Amateur Radio, Inc.**, 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.

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ICOM, Bird, CushCraft, Beckman, Fluke, Larsen, Hustler, Antenna Specialists, Astron, Avanti, Belden, W3AU/W3VS, CDE, AEA, Vibroplex, Ham-Key, CES, Amphenol, Sony, Fanon/Courier, B&W, Anteco, Shure. **LaRue Electronics**, 1112 Grandview St., Scranton PA 18509, 343-2124.

### Houston TX

Experimenter's paradise! Electronic and mechanical components for computer people, audio people, hams, robot builders, experimenters. Open six days a week. **Gateway Electronics, Inc.**, 8122 Clarkcrest, Houston TX 77063, 978-6575.

### San Antonio TX

Complete 2 way service shop. Call Dee, W5FSP. Selling Antenna Specialists, Avanti, Anden, Bird, Hy-gain, Standard, Vibroplex, Midland, Henry, CushCraft, Dielectric, Hustler, ICOM, MFJ, Nye, Shure, Cubic, Tempo, Ten-Tec and others. **Appliance & Equipment Co., Inc.**, 2317 Vance Jackson Road, San Antonio TX 78213, 734-7793.

### Tacoma WA

Tacoma area dealer for Kenwood, Cubic, Cushcraft Antennas, Hustler Antennas, all amateur marine and commercial two-way radio supply. See our used radio dept. **Northwest Radio Supply**, 3040 South Puget Sound, Tacoma WA 98409, 475-3619.

### Yakima WA

Central Washington's newest Amateur Radio Store. New and used amateur radio sales and service. Ham Radio Equipment—All Brands—Buy—Sell—Trade. **The Radio Store**, 1505 Fruitvale Blvd., Yakima, WA 98902. 248-4777.

### Casper WY

Nye Keys, Callbook, FM Transceivers, Antenna wire, 12 Volt Supplies. Evening and Saturday hours. **Radio Activity**, 531 W. Collins Dr., Casper WY 82601. 237-5348.

## DEALERS

*Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the October issue must be in our hands by August 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.*

# PROPAGATION

*J. H. Nelson*
*4 Plymouth Dr.*
*Whiting NJ 08759*

## EASTERN UNITED STATES TO:

| GMT: | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14A | 14 | 7 | 7 | 7 | 14 | 14 | 21A | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14A | 7A | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21A |
| CANAL ZONE | 21 | 14A | 7A | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21A |
| ENGLAND | 14 | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 21 | 21 | 14A | 14 |
| HAWAII | 21A | 14 | 7A | 7 | 7B | 7B | 7 | 14 | 14 | 14 | 21 | 21 |
| INDIA | 14 | 7A | 7B | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 | 14 |
| JAPAN | 14A | 14 | 14 | 7B | 7B | 7B | 7B | 7 | 14 | 14 | 14 | 14A |
| MEXICO | 14A | 14 | 7A | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 21 | 14A |
| PHILIPPINES | 14A | 14 | 7B | 7B | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 |
| PUERTO RICO | 14 | 7A | 7 | 7 | 7 | 7 | 7A | 14 | 14A | 14A | 14A | 14 |
| SOUTH AFRICA | 14 | 7B | 7B | 7 | 7 | 14 | 14 | 21 | 21A | 21A | 14 | 14 |
| U. S. S. R. | 7 | 7 | 7 | 7 | 7 | 7A | 14 | 14A | 14A | 14 | 14 | 14 |
| WEST COAST | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 14A | 21 | 21 | 21 |

## CENTRAL UNITED STATES TO:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14A | 14 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14A | 7A | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21A |
| CANAL ZONE | 21 | 14A | 7A | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21A |
| ENGLAND | 14 | 7 | 7 | 7 | 7 | 7 | 7 | 14 | 14A | 14A | 14 | 14 |
| HAWAII | 21A | 14A | 14 | 7A | 7 | 7 | 7 | 14 | 14 | 21 | 21 | 21 |
| INDIA | 14 | 14 | 7 | 7B | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 |
| JAPAN | 14A | 14 | 14 | 7B | 7B | 7B | 7B | 7B | 7 | 14 | 14 | 14A |
| MEXICO | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |
| PHILIPPINES | 14A | 14A | 7B | 7B | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 |
| PUERTO RICO | 14A | 14 | 14 | 7 | 7 | 7 | 7A | 14 | 14A | 14A | 21 | 21 |
| SOUTH AFRICA | 14 | 7B | 7B | 7B | 7B | 14B | 14 | 21 | 21A | 21A | 14 | 14 |
| U. S. S. R. | 7 | 7 | 7 | 7 | 7 | 7B | 7B | 14 | 14A | 14 | 14 | 7A |

## WESTERN UNITED STATES TO:

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 21 | 14 | 14 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21A |
| AUSTRALIA | 21 | 14A | 14 | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21A |
| CANAL ZONE | 21 | 14A | 14 | 7 | 7 | 7 | 7A | 14 | 21 | 21A | 21A | 21A |
| ENGLAND | 14 | 7 | 7 | 7 | 7 | 7 | 7B | 14 | 14A | 14 | 14 | 14 |
| HAWAII | 21A | 21 | 14A | 7A | 7 | 7 | 7 | 14 | 14 | 21 | 21 | 21A |
| INDIA | 14 | 14 | 14 | 7A | 7B | 7B | 7B | 7B | 14 | 14 | 14 | 14 |
| JAPAN | 21 | 14 | 14 | 14 | 7A | 7 | 7B | 7B | 7 | 14 | 14 | 14A |
| MEXICO | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14A | 14A | 14A |
| PHILIPPINES | 21 | 14A | 14 | 7 | 7 | 7B | 7B | 7A | 14 | 14 | 14 | 14A |
| PUERTO RICO | 21 | 14 | 14 | 7 | 7 | 7 | 7 | 14 | 14 | 14A | 21 | 21 |
| SOUTH AFRICA | 14 | 7B | 7B | 7B | 7B | 7B | 14 | 14 | 14A | 21A | 14A | 14 |
| U. S. S. R. | 7 | 7 | 7 | 7 | 7 | 7B | 7B | 14 | 14A | 14 | 14 | 7A |
| EAST COAST | 14A | 14 | 7 | 7 | 7 | 7 | 7 | 14 | 14A | 21 | 21 | 21 |

**First letter = day waves  Second = night waves**
**A = Next higher frequency may also be useful**
**B = Difficult circuit this period  F = Fair**
**G = Good  P = Poor  * = Chance of solar flares**

## AUGUST

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| | | | | | | 1 P/P* |
| 2 F/F | 3 G/F | 4 G/F* | 5 G/F | 6 G/G | 7 G/G | 8 G/F |
| 9 G/F | 10 G/F | 11 G/F | 12 G/G | 13 G/G | 14 G/G | 15 G/G |
| 16 G/G | 17 G/G | 18 G/F | 19 G/F | 20 G/G | 21 G/G | 22 G/F* |
| 23 P/P* 30 G/G | 24 P/P* 31 G/G | 25 F/P | 26 G/F | 27 G/G | 28 G/G | 29 G/F |

# THE EVOLUTION OF A CHAMPION!

# FT-101ZD Mk III

The FT-101ZD Mk III is the latest chapter in the success story of the FT-101 line. Armed with new audio filtering for even better selectivity, the FT-101ZD now includes provision for an optional FM or AM unit. Compare features and you'll see why active operators everywhere are upgrading to Yaesu!

### Variable IF Bandwidth

Using two 8-pole filters in the IF, Yaesu's pioneering variable bandwidth system provides continuous control over the width of the IF passband — from 2.4 kHz down to 300 Hz — without the shortcomings of single-filter IF shift schemes. No need to buy separate filters for 1.8 kHz, 1.5 kHz, etc.

### Improved Receiver Selectivity

New on the FT-101ZD Mk III is a high-performance audio peak/notch filter. Use the peak filter for single-signal CW reception, or choose the notch filter for nulling out annoying carriers or interfering CW signals. In the CW mode, you can choose between the 2.4 kHz SSB filter and an optional CW filter (600 or 350 Hz) from the mode switch.

### Diode Ring Front End

The FT-101ZD now sports a high-level diode ring mixer in the front end. This type of mixer, well known for its strong signal performance, is your assurance of maximum protection from intermod problems on today's crowded bands.

### WARC Bands Factory Installed

The FT-101ZD Mk III comes equipped with factory installation of the new 10, 18, and 24 MHz bands recently assigned to the Amateur Service at WARC. In the meantime, use the 10 MHz band for monitoring of WWV!

### RF Speech Processor

Not an additional-cost option, the FT-101ZD RF speech processor provides a significant increase in average SSB power output, for added punch in those heavy DX pile-ups. The optimum processor level is easily set via a front panel control.

### Worldwide Power Capability

Every FT-101ZD comes equipped with a multi-tap power transformer, which can be easily modified from the stock 117 VAC to 100/110/200/220/234 VAC in minutes. A DC-DC converter is available as an option for mobile or battery operation.

### Convenience Features

Designed fundamentally as a high-performance SSB and CW transceiver, the FT-101ZD includes built-in VOX, CW sidetone, semi-break-in T/R control on CW, slow-fast-off AGC selection, level controls for the noise blanker and speech processor, and offset tuning for both transmit and receive. The Mk III optional FM unit may be used for 10 meter FM operation, or choose the optional AM unit for WWV reception or VHF AM work through a transverter (AM and FM units may not both be installed in a single transceiver).

### Full Line of Accessories

See your Yaesu dealer for a demonstration of the top performance accessories for the FT-101ZD, such as the FV-101Z External VFO, SP-901P Speaker/Patch, YR-901 CW/RTTY Reader, FC-902 Antenna Tuner, and the FTV-901R VHF/UHF Transverter. Watch for the upcoming FV-101DM Digital Memory VFO, with keyboard frequency entry and scanning in 10 Hz steps!

### Nationwide Service Network

During the warranty period, the Authorized Yaesu Dealer from whom you purchased your equipment provides prompt attention to your warranty needs. For long-term servicing after the warranty period, Yaesu is proud to maintain two fully-equipped service centers, one in Cincinnati for our Eastern customers and one in the Los Angeles area for those on the West Coast.

Note: A limited quantity of the earlier FT-101ZD (with AM as standard feature) is still available. See your Yaesu dealer. FT-101ZD Mk III designates transceivers bearing serial #240001 and up, with APF/Notch filter built in and AM/FM units optional.

681

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU '83

**The radio.**

**YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007**
**YAESU Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 ● (513) 874-3100**

# Hand-shack.

## TR-2400

Put a ham shack in your hand. The TR-2400 is the ideal hand-held for 2 meters FM. It features a large LCD readout that can be read in direct sunlight or in the dark, 5-kHz-step PLL synthesized operation, 10-channel memory, scanning, and 16-button autopatch DTMF encoder.

**TR-2400 FEATURES:**

- **Large LCD digital readout**
  Readable in direct sunlight (better than LEDs). Readable in the dark (with lamp switch). Virtually no current drain (much less than LEDs) and display stays on. Rugged and dependable in hot or cold temperature ranges. Shows receive and transmit frequencies and memory channel.
- **5-kHz-step frequency selection**
  PLL synthesized keyboard channel selection system. No "5 up" switch needed. Selects from 144.000 to 147.995 MHz.

**CONVENIENT TOP CONTROLS**

- **UP/DOWN manual scan**
  Single or fast continuous 5-kHz steps from 143.900 to 148.495 MHz for Amateur and MARS or CAP simplex or repeater operation.
- **10 memories**
  Retained with battery backup (only 2.0 mA). "M0" memory may be used to shift the transmit frequency any desired amount to operate on repeaters with nonstandard split frequencies.
- **Built-in autopatch DTMF encoder**
  All 16 buttons of keyboard provide telephone dual-tones while transmitting.
- **Automatic memory scan**
  Checks all 10 memory channels. Programmable to lock automatically on either BUSY (signal present) or OPEN (no signal) channels.
- **Repeater or simplex operation**
  Convenient mode switch shifts transmit frequency +600 kHz or -600 kHz or to the frequency stored in "M0" memory.

- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.

Microphone PTT and audio terminals

Charger terminal

Earphone Jack

- **Reverse operation**
  Push-button switch shifts receiver to transmit frequency and transmitter to receive frequency.
- **BNC antenna connector**
  Easy to connect external antenna.
- **LCD "arrow" indicators**
  Show "ON AIR" "MR" (memory recall), "BATT" (battery status), and "LAMP" switch on.
- **High-impact case and zinc die-cast frame**
  Extremely rugged with antenna counterpoise.
- **External PTT microphone and earphone connectors**
  Easily accessible on right side of transceiver.
- **Compact and lightweight**
  Only 2-13/16 inches wide, 7-9/16 inches high, and 1-7/8 inches deep. Weighs only 1.62 pounds (including antenna, battery, and hand strap).

**Standard accessories included:**

- Flexible rubberized antenna with BNC connector
- Heavy-duty (450-mAh) NiCd battery pack
- External-standby (PTT) plug
- External-microphone plug
- AC charger
- Hand strap
- Earphone

More information on the TR-2400 is available from all authorized dealers of Trio-Kenwood Communications, Inc., 1111 West Walnut Street, Compton, California 90220.

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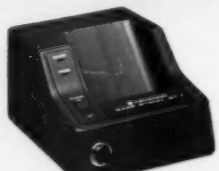
**Optional accessories:**

- ST-1 base stand (shown) which charges to 90% (to protect battery) in 1.5 hours, with 4-pin connector for dynamic microphone and SO-239 antenna connector
- BC-5 DC quick (90%) charger
- SMC-24 speaker/microphone
- LH-1 deluxe leather case (top-grain cowhide)
- PB-24 extra battery pack with charger adapter
- BH-1 belt hook



*Specifications and prices are subject to change without notice or obligation.*